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***The use of an electronic health record (EHR) in a
maternity shared-care environment***

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Health Care)

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Abstract

Background

The paper hand-held record (PHR) has been used as a successful and integral tool in maternity shared-care for many years. A pregnant woman carries her PHR with her and the care given is documented at each visit to either the General Practitioner (GP) or the hospital health care provider. Increasingly, patient electronic health records (EHR) are increasingly being implemented around the world. Implementing electronic records is often driven by government regulations or financial institutions predominantly in the USA, the UK and Denmark (1-3). EHRs are designed to enhance integration between patients and health care providers and contain information in a digital format that can be used by both patients and health care providers, from anywhere, at any time. In 2012, in alignment with the Australian National Personally Controlled EHR (PCEHR), the Mater Mothers' Hospital (MH) developed and implemented a Mater Shared Electronic Health Record (MSEHR) in conjunction with GPs in a shared-care setting. Prior to the introduction of the MSEHR, maternity information was documented in a PHR.

Research Design

A comparative cohort, multimethod design was chosen using:

1. Quantitative extraction of evidence based, best practice variables:
 - To identify and compare the PHR and the MSEHR (for completeness of the specific evidence based, best practice variables, using a Pearson chi-squared analyses (or Fishers Exact tests for cell sizes less than 5). An alpha level of 0.05 was used to detect statistical significance.

2. Qualitative data collection, using face-to-face interviews and focus groups, coded manually using content analysis:
 - To explore and compare women's experiences when using the PHR and the MSEHR,
 - To determine how the integration of care for health care providers differs between the PHR and the MSEHR.

Results

Completeness of best practice variables

While neither the PHR nor the MSEHR completely captured all required best practice variables, use of an EHR demonstrated improved access to antenatal clinical information and provided greater adherence and completeness in collecting these variables. While the PHR recorded best practice variables, many of these were difficult to locate in a free text form and were only retrospectively found by an audit. The MSEHR has the capacity to further improve data capture by providing specific fields in which to enter the best practice variables. The variables not captured well in the MSEHR were due to absence of data entry fields.

Experiences of women using the PHR and MSEHR

Women unanimously talked about 'liking' the PHR and carried it with them, however many did not look through the whole document or in any detail, and so did not realise the full potential of the record. Most of the responses from women described the MSEHR favourably and most did complete the sign-up process to gain a log-in. Women reported a willingness to use the MSEHR but did not do so, due to lack of instruction or support. There were women who did not get their log-in to work but still considered the MSEHR to be an advantageous option over using the PHR and the 'way of the future'.

Health care providers and integration of care using a PHR and MSEHR

GPs thought the PHR was a familiar document but with information that was not necessary for them. When GPs were asked about using the MSEHR, most

comments were around frustration with getting access to the record. The MSEHR was reported to have too many steps to log-in or be very slow to open. GPs were keen to access discharge summaries through the MSEHR.

Midwives and doctors were familiar with manually documenting maternity information on the PHR and thought it to be a good 'journal' or 'diary' of a woman's pregnancy. Furthermore, when using the MSEHR, midwives and doctors talked about the duplication of having to enter data into one database system screen but open another system screen to view output. They also talked about data entry fields changing when modifications were made to the database, resulting in discrepancies with output. None of the hospital health providers were aware of the MSEHR from a woman's perspective.

Allied health did not use either the PHR or the MSEHR, but instead wrote their notes in a hospital chart. They did, however, consider both the PHR and MSEHR as useful tools to alert other care providers of a referral that had been made.

Conclusions

While outside the scope of this thesis, further work to encourage engagement of women and health care providers is needed to move the MSEHR system forward. For the MSEHR to be successful it is essential that future research ascertains the needs of women, workflow processes are revisited and modified with associated educational materials. Additionally ongoing training should be provided, computer compatibility and access issues both within hospital and with GP practices should be addressed, and stakeholder collaboration should continue.

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

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Publications during candidature

Peer-reviewed papers

Hawley G, Jackson C, Hepworth J, Wilkinson S. Sharing of clinical data in a maternity setting: How do paper hand-held records and electronic health records compare for completeness? BMC Health Services Research, 2014.14(650):2-9.
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Hawley G, Janamian T, Jackson C, Wilkinson S. In a maternity shared-care environment, what do we know about the paper hand-held and electronic health record: a systematic literature review? BMC Pregnancy and Childbirth 2014 14:52.
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Conference abstracts

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3. Hawley G, Jackson C, Wilkinson S, Janamian T. In shared-care environment, what do we know about the maternity record? GP12 Conference, Gold Coast, 25-27 Oct 2012.
4. Hawley G, Wilkinson S, Janamian T, Jackson C. In a maternity shared-care environment, what do we know about the paper hand-held record? Primary Health Care Research Conference, Canberra, 18-20 July, 2012.
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Contributor	Statement of contribution
Glenda Hawley	Wrote the paper (80%) Data coding, analysis and interpretation (80%)
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Claire Jackson	Edited paper (20%)
Shelley Wilkinson	Edited paper (10%)

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Tina Janamian	Conducted search strategy (10%) Design of paper (80%) Wrote the paper (10%) Edited paper (50%)
Claire Jackson	Edited paper (25%)
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Contributions by others to the thesis

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Statement of parts of the thesis submitted to qualify for the award of another degree

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paper hand-held record, electronic health record, general practitioner, doctor, maternity, antenatal, shared-care, hospital health care provider, best practice variable, quantitative, qualitative, multimethod, allied health, dietitian

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Abbreviations

ANC	antenatal clinic
GP	general practitioner
EHR	electronic health record
MSEHR	Mater shared electronic health record
MMH	Mater Mothers' Hospital
PHR	paper hand-held record
PCEHR	Personally controlled electronic health record

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PART 1: SETTING THE SCENE

Chapter 1

Background

1.1 Introduction

The paper hand-held record (PHR) has been used as a successful and integral tool internationally in maternity shared-care for decades. Hamilton introduced the 'Co-op (co-operation) card' in 1956 in the United Kingdom (UK) and since this time, women and clinicians have used some version of a PHR to record maternity care provided (1). The PHR continues to be widely used in the UK and also in Australia and New Zealand (2). Antenatal women carry the PHR and the care given is documented at each visit to either the General Practitioner (GP) or the hospital health care provider. Evidence shows that PHRs improve communication between health care providers and women, reduce women's anxiety and increases involvement in their own care (3).

The benefits of the PHR have been demonstrated in previous, mainly descriptive, studies, but little formal evaluation has been done on the completeness of data collected or on the experiences of health care providers using the PHR.

Increasingly, PHRs are being replaced by electronic health records (EHRs), which have been implemented around the world (4). The adoption of these electronic records is often driven by government regulations or financial institutions, predominantly in the USA, the UK and Denmark (5-7). Some EHRs seeking efficiency and quality improvements have been designed to enhance integration between patients and health care providers and provide access to information in a digital format that can be used by both patients and health care providers, from anywhere at any time (8). Digital records are accessed using a variety of devices and media, including USB stick (portable memory) and web-enabled interfaces of personal computers, smart phones or tablets.

Additionally, much work has been done to evaluate the implementation of EHRs in a variety of health care settings, such as hospitals, pharmacies, GP surgeries and allied health care providers (psychology, dietetics, social work and physiotherapy) (4). Implementation issues of standardising processes, safety and security, promoting evidence based practice, ease of use, easing workload and using less paper charts have all been cited and continue to challenge the use of the full potential of EHRs (4, 8).

This thesis addresses the gap in knowledge regarding quality of records and user perspectives in moving from paper to electronic based records in a maternity GP shared-care setting.

1.2 Study setting

The Mater Mothers' Hospital (MMH) is a tertiary referral maternity hospital. It has a long established shared-care arrangement with local GPs who have completed an accredited alignment program with the hospital. This alignment program is coordinated with obstetric advisory consultation and involves an online and seminar program with assessment and regular accreditation. Alignment obtains RACGP (Royal Australian College of General Practitioners) Group 1 points for the GP. The GP must have current medical indemnity insurance. If alignment conditions are not maintained, the GP is removed from the maternity database. In a GP shared-care arrangement, low risk antenatal women visit the MMH routinely at booking in and again at the 36–40 week gestation period. The aligned GP manages the care of women at visits between these time periods (9). The MMH has specific antenatal clinics where women from different ages, and broad ethnic and indigenous groups attend.

1.2.1 GP shared-care at the MMH

Shared-care is a service provided between the primary and secondary care sectors, with GPs as the fundamental component to providing a continuum for women-centred care throughout their pregnancy (10). Traditionally, women and health care providers participating in GP shared-care have used a PHR to document maternity information. To improve the integration of care between the shared-care sectors, a clinical pathway was developed at the MMH and added to the PHR. As a guide to define the roles of both the GP and the hospital providers in the management of the woman throughout her pregnancy, this pathway incorporated an antenatal visit schedule and a checklist acting as a clinical prompt, delineating the activities to be conducted (11). The full pathway, seen in Appendix 1 is in the PHR used at the MMH and is still widely accepted as a clear guide to best practice expectations of each provider at each antenatal visit. The pathway has streamlined antenatal care and provided a direct link between GP and hospital responsibilities, with an emphasis on

creating partnerships with and making the woman the centre of her antenatal care. Additionally, the PHR has a section for women to record questions and issues.

1.2.2 The context of 'integration' in the GP shared-care model

In the maternity setting, integration of care is particularly important as many health providers are involved at multiple meeting times throughout the duration of the pregnancy. These providers are both community and hospital based and include predominantly GPs, hospital doctors, midwives and allied health if required. Each of these providers has particular skills and clinical responsibilities and agrees to collaborate in a shared-care model to meet the needs of pregnant women (12).

Collaboration facilitates integration of information between these providers, which is paramount to attaining a common goal of good quality maternity care. Most women have uncomplicated pregnancies, but there are occurrences where prompt intervention and integrated information is required to ensure good outcomes (13). Attitudinally, these providers do not always agree on treatment modes and collaboration is not always synchronous. Differences in the care preferences of GPs, hospital doctors and midwives are well known, including antenatal screening, fetal monitoring and labour inductions. Identifying risks in pregnancy is a top priority for care providers and using a framework for collaboration aims to improve long-term health outcomes and provide a continuity of care (10, 14). Collaboration between providers involves moving away from individual responsibilities to a more coordinated, integrated and cooperative process (14, 15). The maternity PHR has been an integral part of this process and in this study is compared with the MSEHR to ascertain data completeness, experiences using the record methods and how well information is integrated between providers.

1.2.3 Obstetric database (Matrix) at the MMH

The MMH uses a Matrix database, which is an internal obstetric information system used to electronically capture maternity data. Matrix captures data such as demographics, obstetric history, family history, medical and surgical history, allergies, standard observations (e.g. blood pressure), routine laboratory and ultrasound results, and antenatal admissions and visit data. Data can be extracted from Matrix using numerous methods, including with specified inclusion or exclusion

criteria. For example, a user can choose to include first pregnancy only or exclude twin pregnancies for a specified set of women (16).

1.2.4 Antenatal clinic processes

During visits to the antenatal clinic, a pregnant woman is seen by a variety of clinicians, including midwives, allied health and obstetric doctors. The first visit a woman makes to the MMH antenatal clinic is usually in the period between 12 and 16 weeks, known as the 'booking in visit'. At this visit the woman is initially seen by a midwife and a hospital-based doctor, where physical observations and an antenatal history are taken and an appropriate model of care is discussed. If the woman has no significant medical history or antenatal risk factors, the GP shared-care model will be the recommended model of care to use. At this initial visit, the woman can choose to use either a PHR or MSEHR to record antenatal information. During the pregnancy, the woman also has the opportunity to access allied health professionals if required. This may occur as an identified need by the woman or it may come as a referral from the midwife or doctor. Allied health professionals include physiotherapists, social workers, dietitians and psychologists.

1.3 The paper hand-held record (PHR)

The PHR has been used in Australia for 20 years and was introduced to improve communication between pregnant women and maternity health care providers (2, 17). The main aim of the PHR was to give women the opportunity to be more involved in their antenatal care by being informed through sharing of information documented on the PHR. Additionally, the PHR was a useful way for women to share this information with their partner and family, and therefore support the shared-care model of care.

In Australia, versions of the PHR are currently used in New South Wales, Queensland, Victoria, South Australia and the Northern Territory. At times these records are reorganised in updated versions to reflect changing needs (18, 19). Tasmania has recently implemented a maternity shared-care resource incorporating a handheld record, which was updated in 2012 (20).

1.3.1 The PHR at the MMH

The Queensland Health Southern Zone PHR (used at the MMH) was developed from a record previously introduced by the Royal Women's Hospital (Brisbane) and the Brisbane North Division of GPs. Continued development of the content in the PHR has been done by the Maternity, Neonatology and Gynaecology Clinical Services Network within Queensland Health's Southern Zone (18). In addition to obstetricians, midwives and administrators, the network also has GP representation. The PHR was produced by the Clinical Services Team within the Southern Zone Management Unit.

The PHR used at the MMH is similar to versions used in other maternity centres across Queensland and is found in Supplementary file 1. It was introduced in 1996 and, in conjunction with the state government, has been updated as necessary to accommodate the changing needs of maternity care at the MMH.

1.4 The national personally controlled electronic health record (PCEHR)

Australia was considered to possess the necessary technological capabilities to implement a national EHR, with more than 95% of GPs having access to the internet in their practice and using a patient electronic medical record, and more than 85% of Australians widely using the internet (21). The Australian system was trialled on stand-alone and network systems, before being implemented nationally for health care providers and individuals to register as opt-in users. Currently, many medical practices are still waiting for updated IT infrastructure to implement the system, while reports of inoperability between systems, unintuitive controls with multiple log-ins and inconsistencies in data denominator entry deter enthusiasm for the Personally controlled electronic health system (PCEHR) (21-23).

The PCEHR was funded in Australia in the 2010/2011 federal budget and the Australian Government Department of Health and Ageing (DoHA), with the National E-Health Transitory Authority (NEHTA), announced an investment over two years to deliver it (24). While most Australian hospitals have their own EHR, implementing the PCEHR proposed to greatly enhance both the quality and timeliness of available health care information. It was suggested that the PCEHR would allow consumers to

have access to information, better manage their health care online, and be beneficial to health care providers through improved sharing of clinical information.

1.4.1 The EHR at the MMH

In wave 2 of the national EHR rollout, the maternity shared EHR (MSEHR) was introduced at the MMH, Brisbane, Queensland to operate in a GP shared-care environment. The initiative was aimed at addressing the fragmentation of care previously described in the first national primary health care strategy “Towards a 21st Century Primary Health Care System” (25). The strategy identified issues in health care, particularly in maternity care.

The MSEHR was developed as an electronic alternative to the previously used paper-based system, as was to be accessible to internal hospital health care providers, aligned GPs and participating women in a shared-care setting (25). The MSEHR has incorporated access to the system for providers and women via separate doctor and patient portals. The MSEHR was implemented to further improve shared-care integration between GPs, health care providers (midwives, doctors and allied health) and the woman herself to provide safe and effective clinical care. The success of the MSEHR has relied heavily on web technologies, and the incentive to participate in software designed to integrate shared-care information (26).

1.5 The move from the PHR to the MSEHR (2012–2014)

In July 2012, the MMH introduced the MSEHR to replace the PHR to document and store antenatal information. The MSEHR is an online tool that enables women, GPs and hospital health care providers to securely collaborate and share health information electronically. The MSEHR incorporates clinical information extracted from hospital databases (Matrix, Verdi), and uses a separate doctor and patient portal to provide a collated view of a woman’s pregnancy information in a health care summary view (16).

The MSEHR was designed on the fields used in the Matrix database, which enables data to automatically populate the MSEHR at the point of entry. Health care

providers can record information electronically in Matrix instead of writing in the PHR.

Women in the shared-care arrangement can use the MSEHR to electronically access their pregnancy information instead of using a PHR. The MSEHR gives women the option to view their health record online, record questions they might want to ask their GP or hospital provider, record their birth plan and have access to Mater information brochures on pregnancy issues. Additionally, women could enter or update their contact details and control who has access to their information (16). A screen view of the MSEHR home page is found in Appendix 2.

1.6 Research questions

The study was undertaken to investigate the changes that occurred in the move from the PHR to the EHR in a maternity GP shared-care environment with regards to: data completeness, experiences of women and integration of care from a health care provider's perspective. Three research questions were derived from the implementation of a national EHR as part of a national health agenda item.

1. Does the use of the MSEHR improve the completeness of recorded specific evidence based, best practice variables, compared with a PHR?
2. What are the experiences of women when using the MSEHR and PHR?
3. How does the integration of care differ for health care providers using the MSEHR and PHR?

1.7 Outline of the thesis

The thesis is framed by three parts as outlined in Figure 1.1. Part 1 sets the scene and contains three chapters, including this background. Chapter 2 describes the research design including the paradigm used to guide the study, methodology and methods utilised. Chapter 3 reviews the literature relevant to the research questions.

Part 2 contains results papers incorporating methodology and analysis used.

Chapter 4 discusses the quantitative results of data completeness and comprises the published paper: *'Sharing of clinical data in a maternity setting: How do paper hand-held records and electronic health records compare for completeness?'*

Chapters 5 and 6 encompass the separate but equally important qualitative results. Chapter 5 is the first qualitative results paper: *From maternity paper hand-held records (PHR) to electronic health records (EHR): 'What do women tell us about their use?'* which describes responses from women using the PHR and MSEHR. Chapter 6 is the second published qualitative results paper: *'Perspectives from health care providers: does integration of care differ when using a maternity paper (PHR) or electronic health record (EHR)?'* and discusses how the maternity records have facilitated the integration of care for providers using the PHR and MSEHR.

Part 3 examines the outcomes of the thesis. Chapter 7 discusses the main findings and Chapter 8 provides future directions and conclusions from the thesis findings.

1.8 Supervisory Load

This table delineates the division of the supervisory load. Dr Tina Janamian was a supervisor until November 2012 and withdrew her load due to work commitments. Professor Julie Hepworth replaced Dr Janamian from November 2012 to completion of the thesis.

Name of Advisor / Role (Prin/Assoc)	Load for candidate
Professor Claire Jackson c.jackson@uq.edu.au	50%
Dr Tina Janamian (from Sept 2011–Nov 2012) t.janamian1@uq.edu.au	25%
Professor Julie Hepworth (from Nov 2012–Feb 2015) julie.hepworth@qut.edu.au	25%
Dr Shelley Wilkinson shelley.wilkinson@mater.org.au	25%

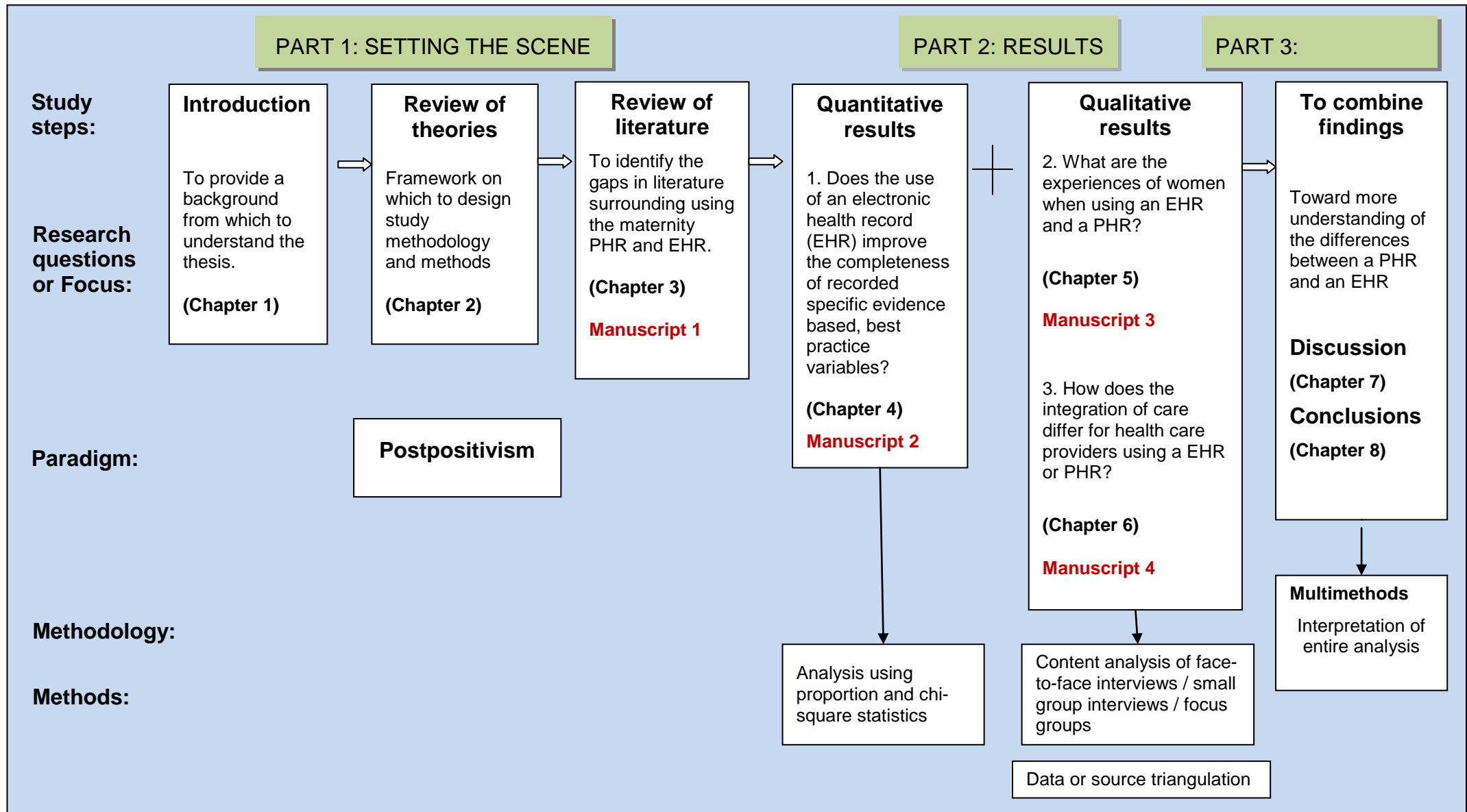


Figure 1.1 Components of the multimethod research design used in the study to explore the differences between the PHR and EHR

Chapter 2

Research Design

2.1 Introduction

A comparative cohort, multimethod design was chosen to address the three research questions described in Section 1.6. The study was divided into two phases:

- Phase 1 – Users of a maternity PHR.
- Phase 2 – Users of a maternity EHR.

In each of the phases, two sets of data have been collected separately.

- *Quantitative best practice data collection* – a comparison of specific evidence based, best practice variables from a manual audit of the PHR and data extraction of these variables from the MMH Matrix database.
- *Qualitative interview data collection* – information collected from face-to-face, small group interviews and focus groups, from antenatal women, GPs and hospital health care providers.

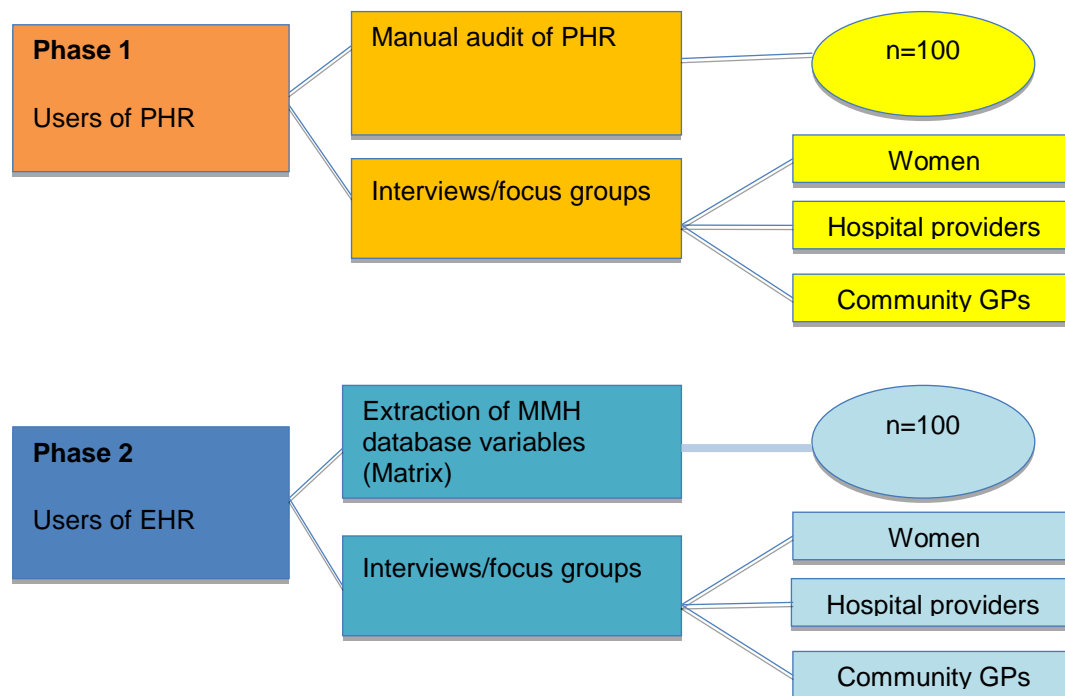


Figure 2.1 Study design showing phase 1 using the PHR and phase 2 using the EHR

2.2 Methodology

2.2.1 Background

There is a great deal of literature surrounding EHRs, but not specifically in the maternity setting and not comparing the use of the traditional PHR with the EHR.

To answer the research questions, exploring completeness of variables collected in a maternity record required a quantitative data extraction and analysis approach. Additionally, seeking a range of qualitative information from the users of the maternity records provided a comprehensive review of the experiences of benefits and limitations. A triangulation of qualitative methods with face-to-face interviews and focus groups permitted exploration of descriptive experiences and explanations of what is known around using the maternity health records (27).

Combining the quantitative and qualitative data in the multimethod approach described in Section 2.2.2 provided dual and important perspectives about the MSEHR and increased the scope of data collected (28). The analyses and interpretation of these data were carried out separately from each other and the overall thesis findings are based on the results of both analyses. Using both quantitative and qualitative approaches provided an overall strength to the study (28). Appropriate to this study, researchers have described that combining methods is complementary and provides a more accurate representation of reality to improve social science research (28-30). The information found in the results of this study can be used to persuade policy makers to address issues effectively (31).

2.2.2 Multimethod studies

A multimethod design was appropriate for this study as a single methodological design was not sufficient to address all of the research questions described in Section 1.6. Multimethod design research is sometimes referred to interchangeably as mixed methods or multi-approach, and entails the inclusion of two or more sources of data or research methods (32). Although quantitative and qualitative methods are at times regarded as incompatible and having different epistemological commitments, most researchers agree that much can be gained by combining their respective strengths (32). Brewer suggests that in order to address research issues,

a wide variety of conceptual and methodological tools such as interviews and focus groups, as used in this study, are required (33). Additionally, Brewer describes qualitative and quantitative approaches as not being opposite but as being different on the same continuum of elements in the process of research. Utilising the strengths of both approaches compensates for the limitations that each poses if used individually (28, 33). This is affirmed by Foss (31) and Howe (34) by acknowledging that epistemologically different types of knowledge are required to explain complex realms of reality and that it is possible to combine methods in one paradigm, as long as each method is performed well. The multimethod design used in this study uses both quantitative and qualitative approaches, requiring different measurements that are independent, have equal weighting and do not rely on each other to make sense of the results (31, 35).

2.2.3 Using a quantitative approach

A quantitative approach was used to determine the completeness of the recording of variables in the PHR and EHR datasets. This is the basis of research question 1 and from where data measurements are used to derive a conclusion by deduction (27). This method is associated with not only the positivist but also the postpositivist paradigm, where results are determined by a statistical process and not influenced by context or situation. The strength of this method is in the repeatability and reliability of the results, that is, the same measurements should give the same results each time (36). Quantitative methods typically depend on larger samples in order to generalise with confidence from the sample to the population it represents (37). This method was used in this study to compare results from a large number of data variables in a dataset from women with a maternity record, in both the PHR and MSEHR phases of the study.

2.2.4 Using a qualitative approach

A qualitative approach was more appropriate to answer research questions 2 and 3. Qualitative research begins with an intention to explore a particular area, collects data, and generates ideas and hypotheses from these data largely through inductive reasoning (36). Qualitative methods are used in the naturalistic paradigms, including postpositivism. The strength of the postpositivism paradigm is in the validity

(closeness to the truth) achieved by using a selection of data collection methods (that include interviews and focus group).

An iterative process (altering research methods as the study progresses) was used to explore rich in-depth information on the core of the issues, rather than superficial perspectives (36). Homogenous purposive samples of three groups of users of the maternity record were selected to gain an awareness of the important issues related to questions 2 and 3. Homogenous purposive sampling is a strategy employed to gather information from a particular group or subgroups that share similar characteristics. Triangulating the data from the three sub-groups of maternity record users (women, hospital providers and GPs) facilitated a richer understanding of the outcomes (36, 37). The use of triangulation in the study is discussed in more detail in Section 2.2.6.

2.2.4.1 Data transferability, faithfulness and dependability

Rather than reliability and validity, qualitative research seeks transferability, faithfulness and dependability. Authors such as Patton, Silverman, and Green and Thorogood have suggested that the mode of data collection can affect data quality and several strategies are recommended and used in this study (37-39)

In this study, the first of these strategies was transparency. The trustworthiness of qualitative findings is strengthened by the extent to which they were shown to be accurate (40). The investigator has given a clear account of the study design and shown clearly how the coding categories and concepts were developed, critiqued and refined, as well as the way in which quotes were selected (40).

Secondly, it was important to look for and report any disconfirming data. Negative case analysis ensured that any findings which contradicted the general patterns were included (41). For example, if there were answers from women suggesting the EHR was confusing to use, but health care providers supported using the EHR, text was searched for further evidence of divergent responses. Commonalities and exceptions were identified and compared, both within and between transcripts and with the findings of other studies. The findings have been reviewed by an experienced independent qualitative researcher. This step enhanced the investigator's capacity to explore rival explanations (37).

A third strategy was to achieve referential adequacy. Qualitative methods of data analysis can be highly idiosyncratic in the selection and interpretation of what is important (42). The coding of interview transcripts was discussed with a second coder who was experienced in the analysis of qualitative data, and disagreements were resolved through dialogue and consensus (41).

Another strategy was to be reflexive as a researcher, acknowledging that qualitative data was influenced by interactions between the interviewer and the participant. The investigator anticipated some personal views on using the maternity records and was wary not to influence the participants' responses to the questions (37).

2.2.5 Paradigm of inquiry

A paradigm was chosen to umbrella the methodology that enabled the research questions to be answered. Kuhn proposed the concept of a 'paradigm' to describe the set of generalisations, belief systems and values of specialists in specified scientific research communities (43). Kuhn went on to say that a paradigm guides the way things are done or, more formally, how a set of practices are established (43). Patton elaborated on this by describing a paradigm as a "particular world view where philosophy and methods intersect to determine what kinds of evidence are required" (37, p571).

As distinct from a theory, a paradigm is sometimes referred to as a theoretical framework, which influences the way knowledge is studied and interpreted (44, 45). Kuhn described a paradigm as a combination of beliefs, concepts, theories, methodologies and methods to make-up a larger view. Within this combination, paradigms have constituents of all normal scientific activity including: underlying assumptions made, problems defined, areas of investigation required, questions posed, data interpretations determined, conclusions drawn and policy recommendations made at the end of the research process (43). Thus, all theories, as well as the methods generated by them, are ultimately paradigm based (46).

This research is conducted on a philosophical foundation that emphasises ontological and epistemological positions to determine what is reality or what is known, and how this knowledge can be attained or how we might discover this knowledge (43, 47).

Patton suggested that “there is no definitive way to categorise the various philosophical and theoretical perspectives that have influenced and distinguish types of qualitative inquiry” (37, p79). However, Lincoln and Guba clarified and described five main paradigms as: positivism; postpositivism; critical theory; constructivism; and participatory (48).

It is important to understand these paradigms to understand how this study relates to them. Researchers who use a positivist paradigm tend to base their knowledge and methodology on scientific experiments, and argue that reality exists and can be discovered usually by quantitative means. Furthermore, the positivist paradigm can be viewed as taking an empirical view of theory development (or emphasising knowledge related to experience), by which hypotheses can be tested through replicable scientific methods. The postpositivist paradigm can be associated with scientific inquiry, but includes multiple social reality components that are created by different individuals as they interact in a social environment (48, 49). Alternatively, critical, constructivist and participatory paradigms utilise interpretive perspectives of theory that require a relationship between interpretation and the phenomenon being studied (50).

Understanding the underlying assumptions of the paradigms assists in ascertaining the distinctions between them. Researchers identify the two major assumptions in social science inquiry as positivism and postpositivism (48, 51, 52). As mentioned previously, a positivist paradigm relies on using a methodology based on scientific experiments, argues that reality exists, is tangible and can be discovered usually by quantitative means. Considering these assumptions, Mertens, Lincoln and Greenfield describe postpositivism as an extension of positivism, but also identifying with the multidimensional aspects of human behaviour by embracing the interpretive or naturalistic realms (44, 48, 53).

Choosing a paradigm to guide the research was an important component of the study design and integral to developing a framework on which to base the research questions, intent and epistemological assumptions (27). Clark talks about paradigms being qualitative and quantitative in approach, but not being mutually exclusive or incompatible as often thought (54). Additionally, strict categorisations of methods in paradigms can cause simplification and lead to inaccurate assumptions about the

research (54). Patton affirmed this by suggesting that inquiry has expanded well beyond the simplistic view of being merely quantitative or qualitative, but falls somewhere between the deductive positivism and the inductive phenomenological perspectives. Developing the inquiry strategy required to perform research depends on “matching concrete methods to specific questions” posed (37, p69).

Traditionally or more simply understood, health research has been dominated by the positivist paradigm. However, increasingly more qualitative techniques have been included as necessary to explore human behaviours (54). Whether the data be quantitative or qualitative, appropriate methods were needed in this study to ensure validity and rigour, trustworthiness and authenticity (37). The human reasoning in this study is complex and flexible enough to address aspects of a maternity record, while being quite open and naturalistic (37). Furthermore, behaviours, attitudes and values of participants influence the processes outlined in this study as well as its outcomes. The health sciences often want data on outcomes, but also understand that human and social interactions play a great role in influencing these outcomes (37). These assumptions are verified in the work of Karl Popper and Jacob Bronowski, who prescribed both a realist perspective of science and a capability to explain the functioning of observable occurrences (55, 56).

Like the positivist paradigm, postpositivism includes precision, evidence, and logical reality and reasoning methods, but also considers methods that focus on experiences described in interpretative approaches (37, 54). For these reasons, the postpositivist paradigm provided a suitable framework on which to design this study, as illustrated in Figure 2.2 (37, p252).

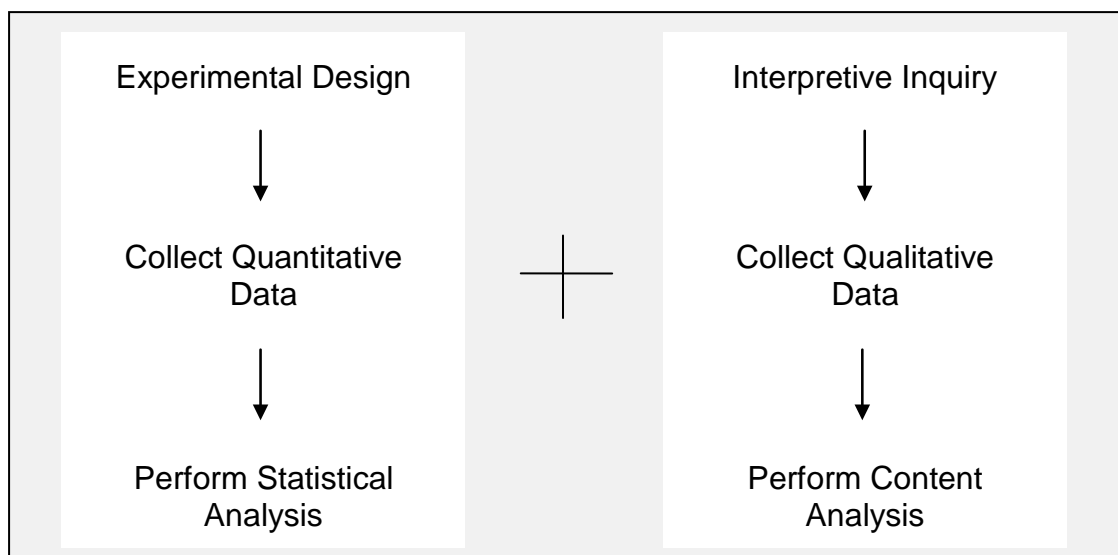


Figure 2.2 Mixture of quantitative and qualitative strategies used in the postpositivist paradigm in this study

As instructed by research question 1 (stated in Section 1.6), quantitative inquiry was used to determine by statistical analysis if there were ‘complete’ or ‘not complete’ variables in a dataset.

While not implying a totally ‘naturalistic’ approach, research questions 2 and 3 utilised a qualitative, interpretive inquiry to explore and uncover meaning related to experiences and how well maternity health records are integrated between the women, hospital clinicians and GPs. The qualitative method permitted an inductive analysis using open-ended and semi-structured questions, depending on what information was required and what emerged from the interviews (37, 53). The purpose of using open-ended questions was to discover the points of views of people without predetermining these views by preselecting questions (37). Conversely, using the semi-structured format afforded strengths that open-ended questions could not. The questions were predetermined and so provided avenues for keeping the interviews on track and minimising the chances of the interview digressing from the topic. With a semi-structured interview, it was more likely that the responses would answer the research questions. Furthermore, even though the questions start off as prescribed, the semi-structure permitted adaptability as the interview progressed (37, 50, 53).

2.2.6 Triangulation

Triangulation means to incorporate or combine more than one method, which consequently serves to strengthen a study (37). The term originates from surveying, where series of triangles are used to map out an area. Triangulation is used to obtain different but complementary data on the same topic (28, 32). The aim of triangulation is not to ascertain that different data sources will show the same results, but rather to find any consistencies that may arise (37). At times, the results found may actually demonstrate differences between groups of data. Patton describes this as “possibly illuminating and adding an opportunity for deeper insight” into the inquiry approach and the research question at hand (37).

Webb was one of the first to reference triangulation and suggested that if a proposition was confirmed by two or more measurement processes, the uncertainty of its interpretation was greatly reduced (57). Flick elaborated by suggesting that triangulation is used to secure an understanding of the question at hand (58). Denzin and Lincoln developed the concept of triangulation to denote any attempt to combine different methods in a research study. In this study, the authors however considered triangulation as more than using multiple methods and defined the concept into four different classifications as explained in Section 2.2.6.1 (59).

2.2.6.1 *Types of triangulation used*

Denzin and Lincoln (59) and Patton (37) describe triangulation in four ways: (1) ‘data or source triangulation’ which entails gathering data through several sampling strategies, so that slices of data are gathered at different times and social situations, as well as on a variety of people; (2) ‘investigator or analyst triangulation’ or the use of several researchers; (3) ‘theory triangulation’ or the use of multiple perspectives to interpret a dataset; and (4) ‘methodological triangulation’ or the use of more than one method to reconcile or integrate data to solve a single problem or program (37, 59).

While this study utilised a multimethod design with both quantitative and qualitative approaches, data or source triangulation was incorporated in the qualitative approach. Interviews and focus groups were used to compare and cross-check the consistency of information attained in different ways (37). The perspectives or

experiences of women, hospital clinicians and GPs were compared and evaluated to determine the similarities and differences.

1.2.6.2 Limitations and benefits of triangulation

Although the perspective of triangulation seems to be very promising, several authors have warned about the hidden problems in the combined use of qualitative and quantitative approaches. Bryman raised four issues (60). Firstly, as quantitative and qualitative research has different pre-occupations, it is highly questionable whether they address the same things even when they are examining apparently similar issues. Secondly, if quantitative and qualitative findings do not confirm each other, how should the researcher respond? Thirdly, if there is conflict in the results, what does it actually mean? Fourthly, a criticism is that triangulation assumes that sets of data from different research methods can be compared and regarded as equivalent in their ability to address a question (60). Thus in the context of combining qualitative and quantitative approaches, the concept of triangulation is not unproblematic (32).

Alternatively, Bryman considers that differences in responses may simply be due to differences in the methods used. Individual interviews may provide more personal views, while focus groups yield more general views. Bryman also suggests that triangulation can be productive, provide valuable insights into the population being studied and may even overcome the weaknesses of any single method (60, 61). Foss affirms triangulation by acknowledging that the combination of research methods within one study is a valid investigative approach (31).

2.3 Ethics approval

2.3.1 Human Research Ethics Committee (HREC) approval

Full ethical approval has been granted from the Mater Health Services Human Research Ethics Committee (reference number 1902M); governance approval from the Mater Health Services Governance Office (reference number 1902M(RG)) and the University of Queensland Medical Research Ethics (reference number 2012000991) (see Appendix 3.1).

2.3.2 Low and negligible risk approval

Low and negligible risk approval was granted from the Mater Health Services (LNR 1780QA) (see Appendix 3.2).

2.4 Research elements

The previous sections have described the theoretical background and methods used in this study to answer the research questions. As the thesis is by publication, the elements of each phase are described within the manuscripts. Table 2.1 outlines where information relating to the method of each phase of the study can be found.

Table 2.1 Placement of research design elements within the thesis

	Phase 1 – PHR	Phase 2 – EHR
Quantitative approach		
<i>Participants</i>	Chapter 4 (p60)	Chapter 4 (p60)
<i>Methods</i>	Chapter 4 (p 61)	Chapter 4 (p 61)
<i>Procedure</i>	Chapter 4 (p 64)	Chapter 4 (p 65)
<i>Analysis</i>	Chapter 4 (p 66)	Chapter 4 (p 66)
<i>Limitations</i>	Chapter 4 (p 72)	Chapter 4 (p 72)
Qualitative approach – women		
<i>Participants</i>	Chapter 5 (p 84)	Chapter 5 (p 84)
<i>Methods</i>	Chapter 5 (p 82)	Chapter 5 (p 83)
<i>Procedure</i>	Chapter 5 (p 85)	Chapter 5 (p 85)
<i>Analysis</i>	Chapter 5 (p 87)	Chapter 5 (p 87)
<i>Limitations</i>	Chapter 5 (p 105)	Chapter 5 (p 105)

Qualitative results – health care providers		
<i>Participants</i>	Chapter 6 (p 117)	Chapter 6 (p 117)
<i>Methods</i>	Chapter 6 (p 115)	Chapter 6 (p 115)
<i>Procedure</i>	Chapter 6 (p 118)	Chapter 6 (p 118)
<i>Analysis</i>	Chapter 6 (p 120)	Chapter 6 (p 120)
<i>Limitations</i>	Chapter 6 (p 131)	Chapter 6 (p 131)

Systematic literature review

3.1 Preface

The purpose of the systematic literature review was to determine what was known about how the PHR and EHR were used in a maternity GP shared-care setting.

The review found specific gaps in knowledge surrounding maternity PHRs and EHRs. There was a surprising lack of information on data completeness of important maternity variables in both the maternity PHR and EHR. While the review discovered some information on the experiences of women and health care providers using the PHR and EHR, it became apparent that more work could be done in comparing the two records for benefits and limitations, particularly from the GP group. The study was designed to address these gaps and aligns with the research questions, which were developed from recommendations in the National Health Care Reform Agenda (62).

Subsequently a paradigm of inquiry informed the study design and methodology, and methods were chosen on which to answer the research questions, presented in Section 1.6.

3.2 Manuscript 1

Hawley G, Janamian T, Jackson C, Wilkinson S. In a maternity shared-care environment, what do we know about the paper hand-held and electronic health record: a systematic literature review. BMC Pregnancy and Childbirth 2014 14:52.

<http://www.biomedcentral.com/content/pdf/1471-2393-14-52.pdf>

In a maternity shared-care environment, what do we know about the paper hand-held and electronic health record: a *systematic literature review*?

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Keywords

Paper hand-held record, Electronic health record, General practitioner, Maternity, Antenatal, Shared-care, Hospital clinician

Abstract

Background

The paper hand-held record (PHR) has been widely used as a tool to facilitate communication between health care providers and a pregnant woman. Since its inception in the 1950s, it has been described as a successful initiative, evolving to meet the needs of communities and their health care providers. Increasingly, the electronic health record (EHR) has dominated the health care arena and the maternity general practice shared-care arrangement has generally adopted this initiative. A systematic review was conducted to determine perspectives of the PHR and the EHR with regards to data completeness; experiences of users; and integration of care between women and health care providers.

Method

A literature search was conducted that included papers from 1985 to 2012. Studies were chosen if they fulfilled the inclusion criteria, reporting on: data completeness; experiences of users; and integration of care between women and health care providers. Papers were extracted by one reviewer in consultation with two reviewers with expertise in maternity e-health and independently assessed for quality.

Results

A total of 43 papers were identified for the review, from an initial 6,816 potentially relevant publications. No papers were found that reported on data completeness in a maternity PHR or a maternity EHR in a shared-care setting. Women described the PHR as important to their antenatal care and had a generally positive perception of using an EHR. Hospital clinicians reported generally positive experiences using a PHR, while both positive and negative impressions were found using an EHR. The few papers describing the use of the PHR and EHR by community clinicians were also divergent and inconclusive with regards to their experiences. In a general practice shared-care model, the PHR is a valuable tool for integration between the woman and the health care provider. While the EHR is an ideal initiative in the maternity setting, facilitating referrals and communication, there are issues of fragmentation and continued paper use.

Conclusions

There was a surprising gap in knowledge surrounding data completeness on maternity PHRs or EHRs. There is also a paucity of available impressions from community clinicians using both forms of the records.

Background

The paper hand-held record (PHR) has been a successful and integral tool used in maternity shared-care for many years. Hamilton introduced the 'Co-op (co-operation) card' in 1956 in the United Kingdom (UK) and since this time, women and clinicians have used some version of the PHR to record maternity care [1]. The PHR continues to be widely used in the UK and also in Australia and New Zealand (NZ) [2]. The woman carries the PHR with her and the care given is documented at each visit to either the community clinician or the hospital. Evidence shows that PHRs improve communication between health care providers, reduce anxiety and increase women's involvement in their care [3]. The benefits of the PHR have been demonstrated in previous, mainly descriptive studies but little formal evaluation has been done on the data collected or on the experiences of health care providers using the PHR.

Increasingly, the use of a patient electronic health record (EHR) has become evident. Internationally, much work has been done on evaluating the implementation of EHRs in a variety of health settings. Implementation issues of standardising processes, safety and security, promoting evidence based practice, ease of use, easing workload and using less paper charts have all been cited [4]. The EHR is designed to use information in a digital format that can be used by both patients and health care providers, from anywhere, at any time [4]. Digital records are accessed using a variety of devices and media, including: USB (portable memory) stick and web-enabled interfaces of personal computers, smart phones or tablets.

The EHR was introduced in Australia in the 2010/2011 federal budget and the Australian Government Department of Health and Ageing (DoHA) with the National E-Health Transitory Authority (NEHTA) announced an investment over 2 years to deliver a national Personally Controlled EHR (PCEHR) [5]. The EHR is proposed to greatly enhance both the quality and the timeliness of available health care information. It is suggested that it will allow consumers to have access to information, better manage their health care online and be beneficial to health care providers through improved sharing of clinical information.

Access to best practice maternity care is a major priority on the Australian national health agenda. To address the fragmentation of care currently provided (in alignment with the PCEHR), a maternity EHR has been developed and is currently being trialled in a general practice (GP) shared-care setting. Shared-care is seen as a service provided between the primary and secondary care sectors, with GPs as the fundamental central component [6]. The EHR in a maternity shared-care setting aims to integrate clinical care between GPs, midwives, allied health professionals and the woman herself. Integration between these care sectors is a significant factor required for effective and safe management of pregnant women, with many approaches being identified [6]. There is evidence of using the PHR as an integration tool between health professionals, but determining if the PHR or the EHR better facilitates this integration is not known. This review was undertaken to investigate the differences in using a PHR and an EHR in a GP maternity shared-care environment with regards to data completeness, experiences of users and integration of care between women and health care providers.

Methods

Search strategy

A search of Medline, OVID, CINAHL, and Embase was conducted, incorporating key words, subject headings and MeSH terms. Papers were excluded if not written in English. To capture all relevant information on the introduction of the maternity record, all evidence levels were included and initially no date restrictions were applied. Once results were first perused, it was decided to only include papers dated after 1985 to capture most of the literature surrounding PHRs. Only full text papers were included. The search was conducted in three stages. The first stage was an open search investigating the maternity health record in paper and electronic formats. Additional topics of experiences and perceptions using ease of functionality and barriers to use were added to the search. The second stage was conducted to extract papers examining data completeness in health records, and the third stage focused on the integration of maternity shared-care model health services.

Initial search strategy terms included variations of: matern*, pregnan*, antenat*, prenat*, perinat*, midwi* AND record*, chart*, note*. Using keywords and MeSH

subject headings, the results were too broad. The search was narrowed down by using focused MeSH for the medical records terms. Truncation for the words perinat*, card*, chart*, note* were then removed. As result numbers continued to be large, the search was narrowed by using the adjacency operator (adj3), with keywords only. The second search built on the first by including MeSH term variations of “data” AND “quality”, “completeness” and “accuracy”. The third search was conducted with MeSH terms including “family physician”, “general practitioner”, “integrated”, “interdisciplinary”, “perinatal care”, “computerised patient record”, “patient access to records”, “medical records” and “personal” to find papers specific to maternity integration in GP shared-care. The PRISMA based flow diagram is shown in Figure 3.1 [7]. The search was verified by two librarians experienced in systematic reviews and can be found in Appendix 4.

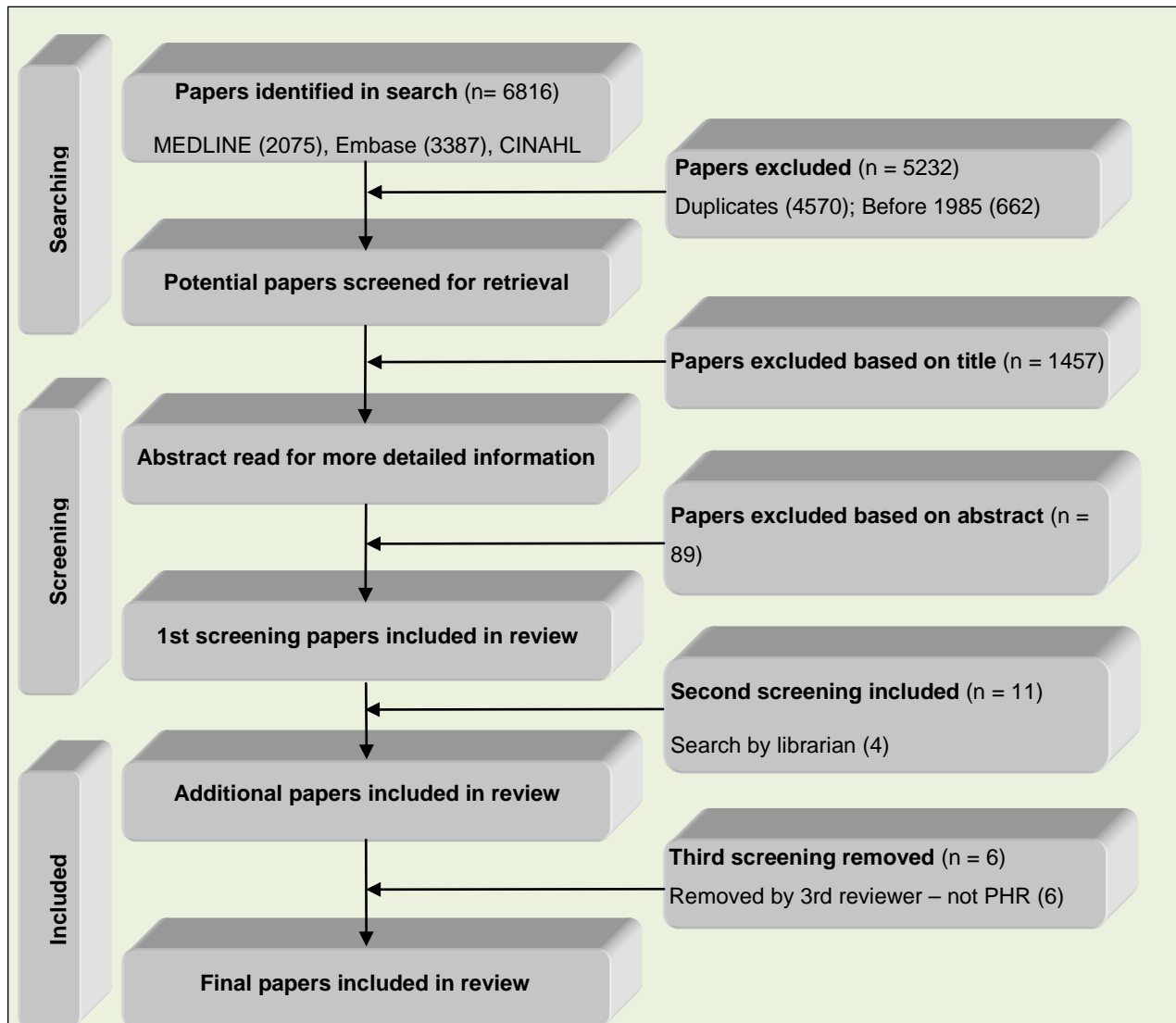


Figure 3.1 Study selection flow diagram

Study selection

Table 3.1 summarises the inclusion and exclusion criteria of the published papers in the review. Quantitative and qualitative papers were included if they contained information relevant to three key elements:

1. Data completeness in a PHR and EHR,
2. Experiences of women and health providers when using a PHR and EHR for perceptions, satisfaction and usability, and
3. Maternity shared-care as an integrative model using a PHR and EHR for teamwork, clinical input and process deliverables.

Table 3.1 Inclusion and exclusion criteria for the systematic review

Review Concepts	Inclusion Criteria	Exclusion Criteria
EHR	1. An EHR is defined as a system that operates between hospital, community setting and patient. The record is accessible by hospital clinician, patient (or woman) and community clinician.	1. Any electronic system that operates within a hospital (including linking hospital departments) and is not accessible by external facilities.
PHR	1. Person can include “patient”, “client”, “woman”. 2. Paper record is portable and hand-held. 3. Record can be known as “notes”, “chart” or “card”. Shared-care record can be known as “home-based record” in developing countries.	1. Any paper record that is an in hospital based medical chart or notes.
Shared-care environment	1. Setting that is defined as a joint partnership between a specialist (or secondary) and a primary care setting. 2. Care provided is for particular patient (or woman). 3. Can be in developed or developing countries. In developing countries, secondary setting may be defined as a “clinic” or “centre”.	1. Secondary setting where there are attached satellite units of the main facility.
Community General Practitioner (GP)	1. May be defined as a community “physician”, “practitioner”, “provider”. May also work in secondary setting.	1. Private obstetrician

Screening and data extraction

All search strategy results were entered into EndNote X6® (Thomson Reuters, New York, NY, USA) and screened by all titles and abstracts, by one author. An independent search of the literature was conducted by an experienced librarian to verify selection of papers. To gain a global perspective, both international and Australian published papers were included in the review. Once papers were screened for inclusion and exclusion criteria, a summary of findings table was developed. From these findings, studies were systematically grouped into a grid according to perspectives of the research questions and can be viewed in Appendix 5.

The grid was developed by two authors, through previous research related to primary health care and shared-care settings. Characteristics of included papers were summarised by type of study, country, year, methods, setting and population. Findings from the papers were collated and reviewed for inconsistencies by two reviewers. Non-relevant findings were removed and additional information was included as necessary. Outcome data collected was included as available.

Descriptive findings were classified according to the women, hospital and community clinicians, and compared for synthesis or combinations of findings.

Study quality assessment

Study quality was appraised using a mixed-methods research scoring system developed by Leanne Kmet, which proposes assessment criteria for evaluating primary research papers from a variety of fields (63). All included papers were screened by one reviewer and checked for reliability by a second reviewer. If a paper utilised a mixed-method approach, then both quantitative and qualitative assessments were conducted. Thirty papers were assessed qualitatively. Seventeen were quantitative and four were assessed using both quantitative and qualitative assessment criteria. Despite six papers scoring a low rating (including editorials, responses, communications and one abstract), they were included as supplementary papers, providing contextual information from unique settings [8-13].

Data synthesis

Papers included have been examined by considering the following three elements, each with separate components.

1. *Data completeness*

The papers were required to report data on key evidence based antenatal variables, or as obstetrically important before guidelines were available. Data completeness could be presented as frequencies and could be stand-alone or comparative data.

2. *Experiences of users*

As the interpretation of 'experience' can be broad, the term was defined and explained by adding the words: perceptions (feelings), satisfaction (likes and dislikes) and usability (functionality, access). Papers were included if the described perspectives of experience were clearly documented from the users of the maternity record, including the pregnant woman herself, hospital clinicians (midwives, allied health doctors) and community practitioners (including GPs participating in a shared-care program).

3. *Integration of care*

Papers that described the components of integration in a maternity shared-care model with community clinicians (including GPs) were included. The papers needed to have mentioned integration in terms of teamwork (collaboration modalities), clinical input (results, visit data) and process deliverables (how to do things, reporting, guidelines and communication strategies). The papers described the integration using or proposing to use either a PHR or an EHR.

Characteristics of included papers

Included papers are summarised in Table 3.2 by the review concepts identified in each of them. Most of the papers were published from the United Kingdom (n = 17) and Australia (n = 16). The remaining papers originated from: USA (n = 2); Zimbabwe (n = 1); Switzerland (n = 2); Denmark (n = 1); Malta (n = 1); Finland (n = 2); and Canada (n = 1). There were 37 original papers. Nine papers used

comparison data and 28 presented descriptive findings. Three papers were reviews, two were responses to original papers and one was a Cochrane review.

Table 3.2 Summary of papers included in the systematic review

Study	Author (ref) (Country)	Question 1. Data completeness		Question 2. Experiences						Question 3. Integration	
		- Only antenatal variables identified		- Perceptions						- Teamwork	
		- Data included as present or not present		- Satisfaction						- Clinical input	
				- Usability						- Process deliverables	
				- Access							
				Women		Hospital Clinicians		Community Clinicians (GPs)			
		PHR	EHR	PHR	EHR	PHR	EHR	PHR	EHR	PHR	EHR
1	Elbourne [14] (UK)			X		X					
2	Lovell [15] (UK)			X		X					
3	Homer [2] (Aus)			X							
4	Brown [16] (UK)			X							
5	Wilkinson [17] (Aus)			X		X					
6	Webster [18] (Aus)			X							
7	Phipps [3] (Aus)			X							
8	Toohill [19] (Aus)					X					
9	Kiran [8] (UK)			X							
10	Holmes [20] (UK)			X		X					
11	Draper [9] (UK)			X		X					
12	Shah [21] (Switzerland)			X							
13	Mahomed [22] (Zimbabwe)			X		X					
14	Turner [23] (USA)			X		X					

15	Patterson [24] (Aus)	X	X				X
16	Wood [25] (UK)	X					X
17	Thomas [26] (UK)	X	X		X		X
18	Halloran [27] (Aus)				X		X
19	Wackerle [28] (Switzerland)		X				
20	Fawdry [29] (UK)				X		
21	Curly [10] (UK)						
22	Homer [30] (Aus)				X		
23	Winthereik [31] (Denmark)		X		X	X	
24	Jones 2002 [32] (UK)				X		
25	Jones 2004 [33] (UK)				X		
26	Henwood [33] (UK)				X	X	
27	Hart [34] (UK)				X		
28	Shaw [35] (Canada)		X				
29	Kouri [36] (Finland)				X		
30	Tindale [37] (UK)				X		
31	Lombardo [38] (Aus)						X
32	Gunn [11] (Aus)						X
33	Sosa [12] (Aus)						X
34	Nel [39] (Aus)						X

35	Field [40] (UK)	X	
36	Haertsch [41](Aus)	X	
37	Bedford [42] (UK)	X	X
38	Jackson [43] (Aus)	X	
39	Dawson [44](Aus)	X	
40	Angood [45] (USA)		X
41	Hakkinen [46] (Finland)		X
42	Savona-Ventura [47] (Malta)		X
43	Knowlden [13] (Aus)		X

Results

Data completeness in a maternity record

There were no papers found in the literature reporting specifically on data completeness in a maternity PHR or a maternity EHR, in a shared-care setting.

Women's experiences using a PHR or EHR in a maternity setting

Table 3.3 provides a summary of women's experiences in using a PHR or EHR in a maternity setting. Specific details relating to perceptions, satisfaction, usability and access are outlined below.

Table 3.3 Summary of women's experiences using PHRs and EHRs in a maternity setting

Experience	PHR maternity record	EHR maternity record
<i>Perception</i>	<ul style="list-style-type: none">• Having more ownership and feeling more in control of pregnancy• More confidence, responsibility• Perceived as getting better care	<ul style="list-style-type: none">• Positive impressions• 80% with record on USB felt safer and would use again• Few concerns over confidentiality
<i>Satisfaction</i>	<ul style="list-style-type: none">• High level of satisfaction, less anxious• Communication improved	<ul style="list-style-type: none">• High level of satisfaction using an internet device
<i>Usability</i>	<ul style="list-style-type: none">• Easy to use• Prefer to carry own notes and would do again• Improved availability to education• Some findings of writing hard to read and difficult to carry	<ul style="list-style-type: none">• Electronic notes useful, easy to understand• Assisted with education, remembering appointments
<i>Access</i>	<ul style="list-style-type: none">• Generally did not lose record• Good access to information for partner, family and friends	<ul style="list-style-type: none">• Improved partner involvement• Some issues with not being able to access record• When data missing from record, expected to recall information

Perceptions and satisfaction

A common perception identified was that women reported having greater ownership and feeling more in control of their pregnancy when using a PHR [2,3,8,14,15,18,23]. It was noted that carrying notes gave women more confidence and women felt more responsible, involved and in charge of their health [3,9,22]. Women were documented as thinking the PHR was a good idea, important and perceived themselves to be getting better care when they had more information [2,3,21,22]. However, one study reported a perception of one third of women using an antenatal record card who felt it had little impact on their care [24]. A generally high level of satisfaction was reported by women when they carried their PHR [2,3,9,14-16,18,20,21,23,25]. Papers reported women thought that talking to midwives and doctors was easier and communication was improved when carrying their own full PHR [2,14-16,20,25,26]. Two papers reported on women being less anxious when using a full PHR [2,14].

Two papers reported on positive impressions of the EHR [28,35]. Wackerle found that four fifths of women who had their maternity notes on a USB stick felt safer, and Shaw indicated that women felt a high level of satisfaction when using an internet enabled device [28,35]. Although women expressed a few concerns over confidentiality, women using the USB stick said they were satisfied with the pregnancy care and would repeat their experience [28].

Usability and access

Women were reported as thinking that the PHR was useful and easy to use [8,20,21]. Most papers reported that women looked after their notes, would prefer to carry their own paper notes and would do so in their next pregnancy [2,8,9,14,15, 16, 22]. Carrying the full PHR was also noted to improve opportunities to receive reminders and educational information, and also motivated them to learn more about pregnancy [3,21-23]. Thomas documented that over 50 percent of women would prefer to have shared-care with the GP, midwife and obstetrician. [26]. However, some papers suggested that different versions of the full PHRs were difficult to use and carry, harder to read and that documentation and efficiency was not improved [2,9,14,17,20]. Despite concerns of decreased access and that women would lose

their PHR, few women did not bring their PHR to appointments [2,3,14,15,20,23]. Papers also documented that women found it advantageous that their husband, family and/or friends could view their record [2,9,15,22]. Phipps noted that women described the PHR as a tangible and important link to the pregnancy fostering sharing of information, while another study found that women did not want access to difficult or problematic information [3,9].

Women reported that EHR notes were considered useful [28,35]. Shaw noted that women thought the EHR was easy to understand and assisted in educating, making decisions and remembering appointments [35]. Wackerle reported that two thirds of women regularly used the USB record, a quarter used the USB record after every consultation and less than one tenth shared the USB record with a community doctor [28]. This paper also suggested improved partner involvement using the USB record. Two papers did suggest that women could not or did not access their EHR [28,31]. Winthereik provided valuable insight into women being responsible participants in their own health care. When using an EHR, if data was missing or the record was not available, the women were expected to recall information that had been communicated or documented on their record [31].

Hospital clinicians' experiences using a PHR or EHR in a maternity setting

Table 3.4 provides a summary of hospital clinicians' experiences in using a PHR or EHR in a maternity setting. Specific details relating to perceptions, satisfaction, usability and access are outlined below.

Table 3.4 Summary of hospital clinicians' experiences using PHRs and EHRs in a maternity setting

Experience	PHR maternity record	EHR maternity record
<i>Perceptions</i>		<ul style="list-style-type: none"> Both positive and negative perceptions. General acceptance, although midwives showed disinterest, confusion and not integral to their role.
<i>Satisfaction</i>	<ul style="list-style-type: none"> Satisfied with using record 	<ul style="list-style-type: none"> Increased reliability of information

	<ul style="list-style-type: none"> • Generally improved communication 	<ul style="list-style-type: none"> • Improved legibility, less duplication. Despite prediction of paperless future, paper continues to be a reality.
	<ul style="list-style-type: none"> • Communicating with midwives sometimes problematic 	
<i>Usability</i>	<ul style="list-style-type: none"> • Some issues with hard to read, increasing workload 	<ul style="list-style-type: none"> • Considered time consuming – to print reports • Links to educational resources useful
<i>Access</i>	<ul style="list-style-type: none"> • Positive overall return rate at visit presentation • Some problems retrieving information if record was forgotten • Concern over documenting sensitive information 	<ul style="list-style-type: none"> • Privacy, confidentiality issues • Restricted and lack of access to hospital or personal computer • Frustration when information not available – not woman's role to recall

Perceptions and satisfaction

Generally, clinicians were noted as reporting satisfaction with using the PHR, stating that it improved communication with women in their care [20,23,24,26,27]. One paper did consider that communicating with midwives was at times problematic when using the PHR [26].

Five papers elucidated both positive and negative perceptions of using the EHR [29,34,36,37,48]. The positive perceptions reported were varied and included a general acceptance of: increased reliability, faster transmission of information, reduced medical errors, access anywhere, less duplication, less use of paper and improved legibility [29,30,34,36,37,48]. However, there were suggestions of problems with standardisation and non-necessity of using an EHR [10,29,33,34,36,37,48]. There was a reported lack of interest in using the EHR by midwives, who found the interface problematic and were confused about what a patient EHR was [34,36,48]. Midwives expressed disinterest and considered the EHR not integral or relevant to their role [33,48]. Two authors commented on the use of paper related to using an EHR. One author considered that in reality, paper will continue to be a necessity in areas where the user is not online, while another

reported that storing images of paper may alleviate this issue of excessive paper [10,29].

Usability and access

Three papers referred to problems with PHR use, including a version of the PHR that had an accompanying educational component [17,24,26]. Negative issues reported about PHR use included: the record was hard to read and time consuming to use, that there were too many prompts for health professionals, that its use resulted in an increased workload, and that the PHR created more administrative load [17,24,26].

Two included papers specifically reported on PHRs being available in a positive and negative context when needed, or at presentation to hospital in the antenatal period [15,19]. One paper reported a positive finding of over two thirds return rate of the PHR at presentation in a busy antenatal assessment unit [19]. However, another paper reported findings of doctors not being able to retrieve information easily from the PHR and not having enough room to document problems or write individual comment [20]. There was also a concern about women having access to sensitive or difficult information such as a 'problem with the baby' when using a PHR [9]. Two papers did find that women did not necessarily have records with them or refer to their record [20,23].

Despite reports of implementing an EHR being expensive, this factor was not thought to be prohibitive to the introduction of such a record [29,30]. Hospital clinicians considered data management (recording and retrieving data) from an EHR as time consuming, particularly for tasks of accessing histories and generating reports [32,48]. Functionalities incorporated into specific EHRs found favourable by staff included: links to educational resources, the obstetric calculator, women friendly language incorporated and a necessity to keep sensitive information confidential [30]. Factors relating to access were negatively described in terms of: issues of dealing with privacy of information, restriction or difficulty accessing and ensuring any data entry or editing could be linked to a person [30,36,37]. Some papers noted staff issues of difficulty using an EHR as concerns over lack of access to a personal computer and also problems with linking information between hospital and community systems [30,32,36]. One paper found that midwives and doctors were

frustrated when information was not available in the EHR. When this occurred, the woman was expected to recall missing information, which was not considered her responsibility [31].

Community clinicians' experiences using a PHR or EHR in a maternity setting

Table 3.5 summarises the lack of information available, as reported from community clinicians. No papers were found that reported on perceptions, satisfaction or usability with a PHR or an EHR.

Table 3.5 Summary of community clinicians' experiences using PHRs and EHRs in a maternity setting

Experience	PHR maternity record	EHR maternity record
Access	<ul style="list-style-type: none"> • Did help to educate women, pictures useful • Divergent findings of accessing PHR. Accessed 51% of times during an antenatal visit. 	<ul style="list-style-type: none"> • GPs expected to fill in blanks or missing results • Reluctant to share information – may be losing more than gaining

Access

Two papers with divergent findings about access to a PHR were found. Holmes reported on experiences of community clinicians accessing the PHR while caring for women, finding that GPs accessed the record about half of the time, about one fifth accessed the record occasionally and over a quarter never asked about the record [20]. Conversely in a community setting in Zimbabwe, clinicians accessed the record to educate women, with information presented as pictures or figures [22].

No papers were found that reported on community clinicians' perceptions or satisfaction with an EHR. The papers that reported on GPs experiences using an EHR tended to be negative. This originated from GPs being expected to fill in laboratory results when they were missing in the EHR [31], or from issues around ownership of information. One paper described GPs as reluctant to contribute

information freely to other providers. They felt their practice health records were already comprehensive [33].

Integration of care using a PHR and an EHR in a maternity setting

Teamwork

Papers reporting varying views of how the GP shared-care model operates using the PHR are summarised in Table 3.6. One survey reported that GPs found teamwork a challenge, citing issues of communication and role distinctions with and between community and hospital clinicians. From this survey recommendations were presented, including the introduction of the PHR to improve communication between health care providers and the woman [11]. Another paper commented on the shared-care model working well, with processes already being formalised, including the PHR [12].

Table 3.6 A summary of how the use of the PHR and EHR has facilitated integration of care in a shared-care model

Components	PHR maternity record	EHR maternity record
<i>Teamwork</i>	<ul style="list-style-type: none"> • Differing views on shared-care model • Challenges with operating as a team member within tertiary setting • GPs expressed inter-professional issues of role distinction, requiring more respect • PHR helped in model and motivated GPs to provide good antenatal care 	<ul style="list-style-type: none"> • Current electronic systems are stand-alone and still use paper • Fragmented electronic systems result in lack of communication between care providers • Focus of electronic record is to provide a woman-centred approach • Woman want improved communication (email facility) between providers and self
<i>Clinical input</i>	<ul style="list-style-type: none"> • Provides opportunity to ensure necessary tests are performed and documented • Sections of pathology, ultrasound assessment, history, visit schedules important 	<ul style="list-style-type: none"> • Has facilitated ease, timeliness of referrals, reminders and notifications • Some information seen as sensitive not appropriate for electronic format

	<ul style="list-style-type: none"> • Good to prevent duplication 	
	<ul style="list-style-type: none"> • Record should be personalised, provision for referrals and space to write notes 	
	<ul style="list-style-type: none"> • Midwives used non-clinical parts of record more 	
<i>Process deliverables</i>	<ul style="list-style-type: none"> • Process to formalise framework of communication between woman and carers 	<ul style="list-style-type: none"> • Electronic record ideal in maternity arena to integrate community, woman, obstetric unit, laboratory
	<ul style="list-style-type: none"> • Can be used in changing or remote settings 	<ul style="list-style-type: none"> • Structure based on guidelines and PHR
	<ul style="list-style-type: none"> • PHR part of process in model of care, with continuing education and practice guidelines 	<ul style="list-style-type: none"> • Used to link specialist services to GPs

There is little information describing the integration of maternity care using an EHR. Two papers cited the current maternity hospital EHR as inadequate, outdated and still required the entry of data from a PHR [45,46]. An EHR has been described as integral to improving disparities in care processes, outcomes and data collection [45]. The EHR is recognised as an important part of health care reform and assists women to have access to high-quality care. Incorporating an email capability is seen as a way to improve communication between woman and provider, however small practices or community clinics may find it difficult to transition to using EHR capabilities [45,46].

Clinical input

The PHR has been noted to provide an opportunity to ensure that necessary clinical tests, such as pathology, ultrasounds and visit schedules are performed and uniformly documented [11,38,39,44,49]. Two papers suggested that documentation on the record was an important part of the process to reduce duplication of scheduled visits [25,26]. Similarly, antenatal guidelines recommend that women should carry their own records to assist in the organisational process of their care and should provide an opportunity to document personal information or concerns, referral and risk assessment information [41,42].

Three authors reported that an EHR system facilitated ease and timeliness of referral and care summaries, with inclusions of reminders and notifications of new information being a positive possibility [13,46,47]. Some data were deemed as not necessary in electronic form due to its sensitive nature, and was better relayed through telephone conversations, although the issue of where to document that information was not clear [46].

Process deliverables

The PHR is documented to be a key component of best-practice antenatal care, providing a single document to formalise a framework of communication of important clinical and process information between health care providers and the woman [11,12,25,27,38-40,42-44]. Even in varied and remote settings, the PHR is documented to be useful in improving outcomes and promoting active involvement in care [39,40]. Also important in this model of care using a PHR was continuing education, practice guidelines, clinical rotations in antenatal clinic settings, review and accreditation [12,38,39,43].

The maternity arena is an ideal setting in which to introduce a patient EHR to integrate information between the community clinic, woman, laboratory and obstetric unit. Using requirements from antenatal guidelines, the EHR can be designed with a clear structure with a single log-in [46,47]. The EHR can be designed using the data fields identified from the PHR, but it has been noted that it should also include antenatal visit and obstetric encounter forms to link specialist services to the GP [42,45,46].

Discussion

This systematic review provides valuable insights into shared-care in a maternity setting, using a PHR and an EHR. Despite the large number of papers initially identified, the review highlights the lack of data completeness studies regarding the use of both PHRs and EHRs in a maternity setting. Globally, there is a current trend of moving from a PHR to EHR, which is surprising without any real evaluation or awareness of how well the data are captured or shared between health care providers using either of these records. While other papers reported on data

completeness in the maternity setting, these focus on hospital perinatal datasets or charts, rather than with a PHR [50,51]. Three papers were also found that reported on completeness of data in records in other health settings [52-54]. One in the area of child health reported that data was more thoroughly completed in a PHR than a clinic chart record [52]. Two papers reported on data completeness in an EHR [53,54]. One in diabetes care regarding documentation of HbA1C readings, the other in a general medical setting, stating that elements essential for a complete clinical history were recorded poorly when using an EHR [53,54]. This paucity of work acknowledges future research is needed in health settings, including maternity shared-care.

A large amount of literature has been published regarding PHRs, largely highlighting women's positive experiences with their use, improving communication and improving feelings of control. Some papers have also assessed clinicians' perceptions and experiences, identifying general satisfaction with PHR use. However, a small number of papers identified administrative and documentation issues (relating to format of the document, its access and privacy of information). The information available from community clinicians using the PHR centres on access for educational opportunities.

With EHRs being a priority on the Australian national health agenda, papers are emerging that document women's and clinicians' experiences, as well as EHRs' impact on the delivery of care. These can be difficult to compare as the EHR has been defined as many things, including a web-enabled form or a stand-alone, USB based record. Overall similar to the PHR, the EHR has been documented as being well received by women. Clinicians' experiences and perceptions reflect the wider confidence with electronic databases of reliable data. However, also reflecting familiarity (or lack of it) with specific systems, some staff are wary of its usability, particularly in relation to accessing the EHR via computers and understanding how to use it. Ideally with improved internet access, the EHR is becoming a valuable data transfer and communication portal.

Although hospital clinicians were frustrated with EHR issues of disinterest, accessibility, paper printing and privacy concerns, both women and hospital

clinicians generally considered the EHR useful for maternity care. Few responses were found from GPs which tended to be negative around missing data.

The review reinforces the model of maternity shared-care as being complex but advantageous to providing effective health care to pregnant women. Many papers describe collaboration in a shared-care environment, with the inclusion of a general practitioner playing an integral role in a multidisciplinary team. The common goal in shared-care is to improve outcomes for both pregnant women and their families through a team of midwives, medical colleagues, GPs, social workers, psychologists and other allied and community workers [55-60]. In recent years, improvements have been made to integrate care providers in the shared-care model by implementing guidelines and specialised training utilising a patient centred focus. This focus requires incorporating direct links in health care provider communication and shared decision making, using consultation, referral, clinical prompts, education strategies, shared-care coordination and using a PHR [43,55,56,61-63]. Using the PHR in a GP shared-care model has been a successful initiative in integrating care and providing opportunities to link information between health care providers and women. While EHRs are promoted as being ideal to use in the maternity arena, this is still very difficult to confidently assess as very few studies have published findings.

This review reinforces the important role a PHR has played in integrating the woman and health care providers in shared-care. Although an EHR is considered valuable in facilitating linkage between care providers and women, the literature to date has not been conclusive in determining if the record will also be important in integrating maternity care.

Limitations of the study

A limitation of the review is the possibility of differences in categorisations of included studies. This is possible as most studies included information on more than one category. As such, the results presented may be classified as pertinent to a different category as well as those presented here. The authors of the studies were not contacted to confirm the categories chosen and we do not think the results would be significantly different if this had been done.

The review also acknowledges the lack of randomised controlled trials available for inclusion. This highlights the need for future RCTs in this field of health care. In some settings, part of the EHR documentation (usually with older versions of an EHR) is associated with the PHR. The authors considered this not to be a limitation, as the review incorporated a synthesis of information, rather than a direct comparison.

Only papers written in English have been included in this review. Although this may be considered a limitation, this inclusion criteria was used for papers from both developing and developed countries.

Conclusions

The findings from this literature review demonstrate a gap in knowledge surrounding data completeness in PHRs and EHRs in a maternity setting. The review reinforces the PHR as being an important tool for women in their maternity care and provides generally positive impressions of using an EHR. Hospital clinicians' views vary using both the PHR and EHR, while community clinicians' views are unclear due to a paucity of available information.

Implications

The gap in knowledge surrounding data completeness in maternity records will prompt future research. The findings of experiences and integration of care will assist policy makers to develop improved models of information access and sharing between women, hospital clinicians and GPs.

Abbreviations

PHR, Paper hand-held record; EHR, Electronic health record; GP, General practitioner

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

GH conducted initial literature search. GH and TJ designed data extraction grid and checked included papers for inclusion and exclusion criteria. CJ made final review of included papers.

GH wrote initial manuscript and CJ, TJ and SW provided extensive review of final manuscript. All authors read and approved the final manuscript.

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PART 2: RESULTS

Chapter 4

Quantitative Approach

4.1 Preface

This section presents a publication describing the criteria used for choosing participants and variables necessary to conduct a quantitative analysis. Results and limitations are also presented.

The objective of the quantitative analysis was to identify and compare the PHR (manual paper audit) and the Mater Shared Electronic Health Record (MSEHR) (extracted from the EHR Matrix database) for completeness of specific evidenced based, best practice variables (further referred to as 'best practice variables'). The data analysed in this quantitative approach were obtained from women participating in GP shared-care with the Mater Mothers' Hospital (MMH).

Best practice variables were chosen after examining the National Clinical Practice Guidelines for antenatal care and guidelines used by the MMH. Quantitative data used to answer research question 1: Does the use of the MSEHR improve the completeness of recorded specific evidence based, best practice variables, compared with a PHR?'

The data analysed were extracted from the MMH Matrix database for women participating in a shared-care arrangement. The analysis informed the quantitative approach of a quantitative, qualitative multimethod study.

4.2 Manuscript 2

Hawley G, Jackson C, Hepworth J and Wilkinson S. Sharing of clinical data in a maternity setting: How do paper hand-held records and electronic health records compare for completeness? BMC Health Services Research, 2014.14(650):2-9.

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Sharing of clinical data in a maternity setting: How do paper hand-held records and electronic health records compare for completeness?

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Abstract

Background

Historically, the paper hand-held record (PHR) has been used for sharing information between hospital clinicians, general practitioners and pregnant women in a maternity shared-care environment. Recently, in alignment with a national e-health agenda, an electronic health record (EHR) was introduced at an Australian tertiary maternity service to replace the PHR for collection and transfer of data. The aim of this study was to examine and compare the completeness of clinical data collected in a PHR and an EHR.

Methods

We undertook a comparative cohort design study to determine differences in completeness between data collected from maternity records in two phases. Phase 1 data were collected from the PHR and phase 2 data from the EHR. Records were examined and compared for completeness of best practice variables collected, informed by local and national maternity guidelines. The primary outcome was the presence of best practice variables identified from the guidelines and the secondary outcomes were the differences in individual variables between the records.

Results

Ninety-four percent of paper medical charts were available by audit in phase 1 and 100% of records from an obstetric database in phase 2. No PHR or EHR had a complete dataset of best practice variables. The variables with significant improvement in completeness of data documented in the EHR compared with the PHR were urine culture, glucose tolerance test (GTT), nuchal screening, morphology scans, folic acid advice, tobacco smoking, illicit drug assessment and domestic violence assessment ($p=0.001$). Additionally the documentation of immunisations (pertussis, hepatitis B, varicella, fluvax) were markedly improved in the EHR ($p=0.001$). The variables of blood pressure, proteinuria, blood group, antibody, rubella and syphilis status showed no significant differences in completeness of recording.

Conclusion

This is the first paper to report on the comparison of clinical data collected on a PHR and EHR in a maternity shared-care setting. The use of an EHR demonstrated statistically significant improvements to the adherence of collected best practice variables. Additionally, the data in an EHR were more available to relevant clinical staff with the appropriate log-in and more easily retrieved than from the PHR. This study contributes to an under-researched area of determining data quality collected in patient records. Having access to up-to-date antenatal information that can be shared between maternity health care providers and pregnant women is fundamental to improving communication between health care providers and improving patient safety.

Introduction

The paper hand-held record (PHR) has been a successful and integral tool used in maternity shared-care for almost 60 years. Hamilton introduced the 'Co-op (co-operation) card' in 1956 in the United Kingdom (UK) and since this time women and clinicians have used some version of the PHR to record maternity care [1]. The woman carries the PHR and care given is documented at each visit to either the community clinician or the hospital. The benefits of the PHR have been demonstrated in previous, mainly descriptive papers but little formal evaluation has been done on the data collected in the PHR [2].

Increasingly, the use of a patient electronic health record (EHR) has emerged together with evaluations of its implementation in a variety of health settings. Implementation issues of standardising processes, safety and security, promoting evidence based practice, ease of use, easing workload and using less paper charts have all been cited [3]. The EHR is designed to use information in a digital format that can be used by both patients and health care providers from anywhere, at any time [3]. Digital records are accessed using a variety of devices and media, including USB (portable memory) stick and web-enabled interfaces of personal computers, smart phones or tablets.

Access to best practice maternity care is a major priority on the Australian national health agenda. To address the fragmentation of data currently available, a maternity EHR has been developed and is trialled at many sites, including a general practitioner (GP) shared-care setting [4, 5]. Shared-care is seen as a service provided between the primary and secondary care sectors, with GPs as the fundamental central component [6]. The EHR in a maternity shared-care setting aims to improve the integration of clinical care between GPs, midwives, allied health professionals, and women.

A major component of integrating clinical care between these sectors is having significant clinical data available as needed. Having access to valid, reliable and complete information is fundamental to improving patient and health care communication and patient safety. The PHR is still the main source of information in a maternity shared-care environment but as this information is written in a free text

form, it may not be retrieved easily if the record is missing or is not accessible for multiple health providers simultaneously. It is not known if the introduction of an EHR will improve access to and completeness and reliability of data or information collected in a maternity record. With an increased emphasis on utilising electronic data and communication systems, the need to know to what extent an EHR will improve the quality of available maternity data is essential. The aim of this study was to describe and compare the completeness of recorded best practice variables in a maternity EHR and PHR.

Methods

Design

The study used a comparative cohort design to determine differences between sets of clinical data collected in two phases. To avoid the possibility of data being collected for the two phases at the same time, phase 1 data collection was completed before the introduction of the EHR. In consultation with the maternity hospital (MMH) statistician, phase 2 data were collected six months after the introduction of the EHR in 2012.

Study setting, participants and data sources

The study was completed in a South-East Queensland (Australia) tertiary maternity hospital (MH) with an established shared-care arrangement with general practitioners (GPs). GPs who share maternity care with the MH are 'aligned' following an education program coordinated with obstetric advisory consultation. In a GP shared-care arrangement, women visit the MH routinely at 'booking in' (~12–16 weeks) and again at the 36–40 week gestation period. The aligned GP manages the care of women at visits between these time periods. During the visits to the antenatal clinic, the women are seen by a variety of clinicians, including midwives, obstetricians, and allied health clinicians (e.g. physiotherapists, social workers, dietitians, and psychologists). At the 'booking in' visit the woman is seen by a midwife and a hospital based doctor, where physical observations and an antenatal history are taken and documented in an antenatal record. Both the hospital health care providers and the GPs are trained in data entry requirements.

Prior to July 2012, the PHR was the only antenatal record available for use at the Mater Mothers' Hospital (MMH). After this date, the MMH introduced a maternity EHR. Antenatal women could elect to use a PHR or an EHR to share information between the hospital and their GP. The EHR has a functionality that does not allow progression of data entry if a mandatory field (i.e. requires an entry) is left blank.

Eligible data for the study were obtained from the hospital dataset pertaining to women who participated in the GP shared-care maternity model of care who were over 18 years of age, and able to understand and speak English. The data analysed in phase 1 of this study were obtained by conducting a chart audit of PHRs used by pregnant women during the period between 01 July 2011 and 31 December 2011. phase 2 data were extracted from the obstetric database; a repository for antenatal information from the EHR at the MMH during the period between 01 January 2013 and 31 June 2013. A comparison of the paper and electronic data systems is seen in Appendix 6. The hospital health care providers and GPs perform the same clinical role in the delivery of care using the PHR and EHR in this setting. The datasets in both phases were randomly selected and included variables collected during the hospital antenatal periods at booking in and 36 weeks, and also visits with the GP.

Outcome variables

Specific evidence based, best practice variables (further referred to as 'best practice variables') were chosen after examining the National Clinical Practice Guidelines for antenatal care and guidelines used by the MMH [7-9]. The guidelines recommend the collection of key clinical data as determined by best practice evidence levels A or B. The guidelines were informed by systematic reviews, National Institute for Health and Care Excellence (NICE) guidelines and relevant Australian guidelines, such as the National Health and Medical Research Council (NHMRC); Australasian Diabetes in Pregnancy Society (ADIPS); MMH's Antenatal Guidelines and New South Wales (NSW) Department of Health [9-14]. Recommendations were based on evidence about the accuracy of assessments in predicting complications in pregnancy and the effectiveness of interventions in reducing symptoms as described in Table 4.1.

Table 4.1 Description of grades of recommendations from National Antenatal Guidelines (64)

Description	Grade
Body of evidence can be trusted to guide practice	A
Body of evidence can be trusted to guide practice in most situations	B
Body of evidence provides some support for recommendation(s) but care should be taken in its application	C
Body of evidence is weak and recommendation must be applied with caution	D
Recommendation formulated in the absence of quality evidence (where a systematic review of the evidence was conducted as part of the search strategy)	CBR*
Area is beyond the scope of the systematic literature review and advice was developed by the Expert Advisory Committee (EAC) and/or the Working Group for Aboriginal and Torres Strait Islander Women's Antenatal Care	PP**

*CBR- Consensus based-recommendation; **PP-Practice point

In phase 1 there were a total of 31 best practice variables identified as important from the guideline documents (see Table 4.2). Prior to phase 2 data collection, the Australian National Antenatal Guidelines were updated and the evidence level of two variables changed. Iodine supplement advice and vitamin D assessment were now categorised to the level CBR and removed from the analysis. Additionally, ADIPS guidelines were revised so that while in phase 1 both GCT (glucose challenge test) and GTT (glucose tolerance test) were collected, in phase 2 only GTT was required [13]. Expert consultation was sought to determine inclusion or exclusion where variables of importance were informed by relevant guidelines but did not have a specific evidence level attributed. These were morphology scanning, alcohol assessment, illicit drug use assessment, and immunisation assessment of pertussis, hepatitis B and varicella. Consequently in phase 2 there were a total of 28 variables identified as best practice. The final set of specific evidenced based, best practice variables are shown in Table 4.2.

Table 4.2 Specific best practice variables included in phase 1 and phase 2 from antenatal guidelines

Specific best practice variables	Evidence level (phase 1 – draft guidelines)	Evidence level (phase 2 – final guidelines)
<i>Clinical measurements</i>		
BMI (body mass index)	B	B
Blood pressure	B	B
Proteinuria	B	B
<i>Screening</i>		
Blood group	B	B
Antibody status	B	B
Haemoglobin	B	B
Human immunodeficiency virus	B	B
Hepatitis B	A	A
Rubella	B	B
Syphilis	B	B
Urine culture (MSU)	A	A
GCT (glucose challenge test)	ADIPS guidelines	Not included
GTT (glucose tolerance test)	ADIPS guidelines	ADIPS guidelines
<i>Pregnancy assessments/advice</i>		
Dating scan	B	B
Nuchal scan	B	B
Morphology	MH guidelines	MH guidelines
Folic acid supplementation advice	B	A
Iron supplement advice	B	B
Use of vitamins in diet assessment	B	B
Iodine supplement advice	NHMRC	CBR

Vitamin D deficiency assessment	B	CBR
Oral health advice	B	B
Tobacco smoking	B	A
Alcohol assessment	MH guidelines	MH guidelines
Illicit drug use assessment	MH guidelines	MH guidelines
Domestic violence assessment	B	B
Mental health assessment (EDPS)	NHMRC	B
<i>Immunisation – pre-conception assessment – recorded</i>		
Pertussis	NHMRC	NHMRC
Hepatitis B	NHMRC	NHMRC
Varicella	NHMRC	NHMRC
<i>Immunisations required in pregnancy – recorded</i>		
Fluvax	NHMRC	A
n = 31		n = 28

The primary outcome measure for the study was a composite score that consisted of all the best practice variables from the PHR and was measured out of 31 in phase 1 and out of 28 in the EHR in phase 2. The secondary outcome measures were each of the best practice variables from the PHR (in phase 1) and the EHR (in phase 2).

Procedure

The data for both the PHR and the EHR were predominantly collected at the first antenatal visit (exceptions were GCT and GTT). The completeness of data available in the PHR was assessed by auditing a sample of medical records (in which PHRs are filed) from pregnant women. One hundred charts were sampled from a possible 641 women who had participated in GP shared-care using a random number generating sequence in Excel. In phase 2 of the study, 100 records were extracted

from the MMH obstetric database, also selected at random from a sample of 732 potential women.

Data were recorded in an audit spreadsheet structured to capture the specific best practice variables described in Table 4.3. Each variable was operationalised as 'present' or 'not present'.

Table 4.3 Description of best practice variables and timing of collection

Best practice variable	Description	Data collection time
<i>Body mass index (BMI)</i>	Measure weight and height and calculate body mass index (BMI).	At first antenatal visit
<i>Blood pressure</i>	Measure blood pressure to identify existing high blood pressure.	At first antenatal visit
<i>Proteinuria</i>	Use an automated analyser if available, or urinary dipstick as less accurate method to detect true proteinuria.	At first antenatal visit or subsequent visits
<i>Blood group</i>	Important to prevent haemolytic disease of the newborn	At first antenatal visit
<i>Antibody status</i>	As above	At first antenatal visit
<i>Haemoglobin</i>	To assess anaemia	At first antenatal visit
<i>Human immunodeficiency virus (HIV)</i>	Offer and recommend HIV testing.	At first antenatal visit
<i>Hepatitis B</i>	Offer and recommend hepatitis B virus testing.	At first antenatal visit
<i>Rubella</i>	Offer and recommend testing for rubella immunity.	At first antenatal visit
<i>Syphilis</i>	Offer and recommend syphilis testing.	At first antenatal visit
<i>Urine culture (MSU)</i>	Use urine culture testing wherever possible as it is the most accurate means of detecting asymptomatic bacteriuria.	At first antenatal visit or subsequent visits
<i>Glucose challenge test (GCT)</i>	To screen for diabetes in pregnancy	Measured at 26–28 week visit
<i>Glucose tolerance test (GTT)</i>	To screen for diabetes in pregnancy	Measured at 26–28 week visit

<i>Dating scan</i>	Offer an ultrasound scan to determine gestational age, detect multiple pregnancies and accurately time fetal anomaly screening.	Between 8 weeks 0 days and 13 weeks 6 days
<i>Nuchal translucency scan</i>	Offer nuchal translucency thickness ultrasound scan.	Between 11 weeks 0 days and 13 weeks 6 days.
<i>Morphology</i>	To check for abnormalities in your baby	Scan at 18–20 week gestation
<i>Folic acid supplementation advice</i>	Inform women of / determine if dietary supplementation with folic acid, from 12 weeks before conception and throughout the first 12 weeks of pregnancy occurred.	At first antenatal visit
<i>Iron supplement advice</i>	Do not routinely offer iron supplementation to women during pregnancy.	At first antenatal visit
<i>Vitamin D deficiency</i>	Offer vitamin D screening to women with limited exposure to sunlight, have dark skin or a pre-pregnancy BMI of >30.	At first antenatal visit
<i>Oral health</i>	Advise / ask about oral health checks and treatment.	At first antenatal visit
<i>Tobacco smoking</i>	Assess the woman's smoking status and exposure to passive smoking.	At first antenatal visit
<i>Alcohol</i>	Advise women who are pregnant or planning a pregnancy that not drinking is the safest option. Discuss alcohol consumed during pregnancy.	At first antenatal visit
<i>Drug use – Illicit assessment</i>	Determine if ever used illicit drugs or requires assistance.	At first antenatal visit
<i>Domestic violence assessment</i>	Explain to all women that asking about domestic violence is a routine part of antenatal care.	At first antenatal visit

Data analysis

The sample size was calculated based on the primary outcome of this research. The calculation was based on evidence found in the literature, reporting on completeness of health record data and in consultation with the MH statistician. Based on literature results of five non-maternity [15-19] and three maternity papers [20-22], it was assumed that 75% of records would be complete in phase 1 and 90% of records would be complete in phase 2. Considering a relative change of 15% between records and using a 95% confidence interval, 97 records were needed in each phase of the study to detect a significant difference in the primary outcome. Data were

analysed using SPSS for Windows (Version 21). Descriptive data analysis was undertaken using frequencies summarised using numbers and percentages. Pearson chi-squared analyses (or Fishers Exact tests for cell sizes less than 5) were planned to compare differences between the PHR and EHR frequencies. An alpha level of 0.05 was used to detect statistical significance.

Ethical clearance

Low and negligible risk ethics clearance was granted from the Mater Health Services (LNR 1780QA).

Results

Of the 100 medical charts audited in phase 1, two charts were missing and four did not have a PHR filed within (usually filed in the hospital chart at delivery) leaving a total of 94 charts available for audit. The number of missing PHRs were reported to the data management team. In phase 2, all records (100) were available from the obstetric database.

Primary Outcome

Completeness of data available from the PHR

From the expected total of 31 variables identified from the guidelines, 21 were recorded in designated fields in the PHR. Of the remaining ten variables, nine had results written in 'free text areas', or in areas with no prompt facility of the PHR, rather than in specific data fields (folic acid, iron supplement advice, vitamin supplement advice, vitamin D deficiency assessment, oral health advice, pre-conception evidence of pertussis, hepatitis B, varicella immunisations and 'fluvax in pregnancy' recommendation). There were no results for one variable (iodine intake advice) in either a designated field or in free text. Of the 31 specific best practice variables, none of the 94 women included in the chart audit had a complete dataset.

Completeness of data available from the EHR

In phase 2, three best practice variables were not included in the composite score because they were no longer considered evidence level A or B in the National Clinical Practice Guidelines and changes were made to the ADIPS guidelines. These variables were GCT, iodine intake advice, and vitamin D deficiency assessment). Of

the 28 variables remaining relevant in phase 2, 26 had available fields present in the EHR. No EHR had a complete dataset.

In consultation with an MH statistician the chi-square analysis could not be performed, as neither phase 1 or phase 2 had a complete dataset of best practice variables.

Secondary Outcomes

Individual variables present in the PHR and EHR are shown in Figure 4.1, where differences in variable completeness are demonstrated between phase 1 and phase 2.

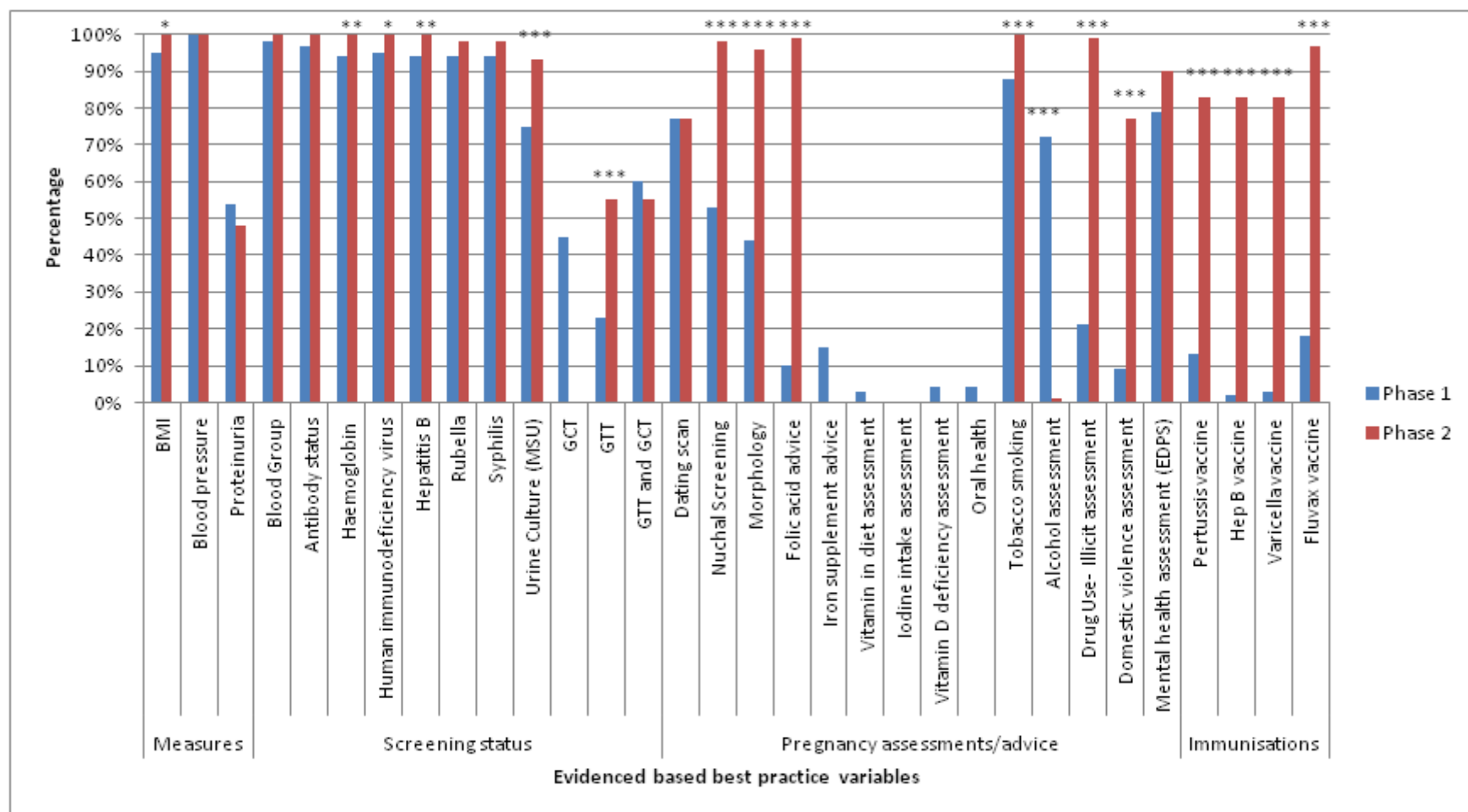


Figure 4.1 Percentages of evidence based, best practice variables between phase 1 (PHR) and phase 2 (EHR)

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$ for comparisons between PHR and EHR

MSU–Midstream urine, EPDS–Edinburgh postnatal depression scale, PHR–Paper hand-held record, EHR–Electronic record

As shown in Figure 4.1, the only variable that did not have data recorded either at a specific data entry field or written in notes in the PHR was 'iodine intake assessment'. Clinical measurements and screening results, excluding proteinuria, GCT and GTT, were recorded within a range of 70–92%, as were dating scan, tobacco screening, alcohol assessment and mental health assessment (all >74%). The remaining variables of assessments/advice and immunisations were recorded poorly, with a variation between 3% and 51% (Figure 4.1). In phase 2, EHR data were more complete. Clinical measurements and screening variables, excluding proteinuria, were recorded with between 93% and 100% completeness. Two variables from the total of 28 included in the analysis did not have a data entry field in the EHR (iron supplementation advice and vitamin in diet assessment), consequently they had no data recorded. Although there was a field for oral health, no data were available. During the introduction of the EHR, numerous changes were made to the alcohol assessment entry fields resulting in data not being recorded well. Recording of the assessments/pregnancy advice and immunisation variables (pertussis, hepatitis B, varicella, fluvax) were high with the EHR with a range of 77–100% completeness.

As demonstrated in Figure 4.1, the variables with improvement in completeness of documentation in the EHR compared with the PHR were measures of urine culture and GTT (both $p=0.001$). Similarly, recording of nuchal screening and morphology scans were significant ($p=0.001$), as were folic acid advice, tobacco smoking, illicit drug assessment and domestic violence assessment ($p=0.001$). The documentation of immunisations (pertussis, hepatitis B, varicella, fluvax) was markedly improved in the EHR ($p=0.001$). The remaining variables were recorded as: BMI ($p=0.02$), haemoglobin ($p=0.01$), human immunodeficiency virus ($p=0.02$) and hepatitis B status ($p=0.01$).

The variables of GCT, iron supplementation, iodine intake assessment, and oral health were not compared for data completeness between the records. When GCT and GTT were combined to ascertain if variances existed due to the change in guidelines, no significant differences were found in data completeness between the PHR and EHR. Across both the PHR and EHR, there were no statistical differences between the clinical measurements of blood pressure, proteinuria, blood group,

antibody status, rubella or syphilis. The assessment of mental health (using the Edinburgh depression scale) also demonstrated no differences in the recording between the records for the completeness of clinical measurements.

Discussion

The data presented provide new insights into the availability of data recorded regarding documentation of care delivered to women in a GP shared-care maternity environment. This paper reports on the completeness of recorded specific best practice variables in a PHR, using counts and frequencies. Neither the PHR nor the EHR had a complete recording of these variables, reflecting an apparent lack of adherence to best practice antenatal care guidelines. However, the comparison between the two record types did demonstrate significant improvements in the completeness of data captured when using an EHR.

Both the PHR and EHR captured information usually collected at the first hospital antenatal visit to varying degrees of completeness. However, it was noted during the chart audit that the PHR variables were entered in an indiscriminate way resulting in troublesome extraction of information (in key data fields within the PHR as well as in free text areas). Previous work has recognised the PHR as a valuable tool to share data between the pregnant woman and her health professionals [2], but this current study demonstrates gaps in the quality of important antenatal information that the record is designed to capture. In practice when information is missing, care providers are required to search alternative databases or telephone for results and/or repeat requests for tests. This is an inefficient use of time and resources and introduces the possibility of clinical errors.

The EHR design provides an overall improvement in completeness of documented antenatal records at scheduled visit times, with significant improvements in important assessments (such as antenatal scans and GTT data) and immunisations recorded. Overall, the EHR provides an avenue for all clinicians to access a more complete antenatal dataset, although the reliance on presence or availability of 'data fields' to capture all best practice variables may be a short-coming if they are not programmed into the system, as was evident in our study. However, the pattern of available data

between the two records does suggest the mode of record keeping does influence the completeness of data captured.

In practice the EHR permits continuity of access to information between hospital and community providers. The EHR has the capacity for information to be available in real time, to multiple users who can simultaneously view and enter data. This is particularly relevant in the shared-care setting, where the community GP provides care to women at potentially ten antenatal visits, but may also be useful when allied health, midwifery and medical staff are all providing care for a woman during a single clinic visit. The introduction of the EHR in a GP shared-care maternity setting is integral to the roll-out of a National EHR in Australia [4]. The MSEHR has demonstrated an improvement in up-to-date, more complete, readily available and accessible information for hospital and community clinicians and the pregnant woman. This initiative is an important step in increasing access to high quality clinical information and integrating care between maternity care providers and women.

A strength of this study was the utilisation of relevant practice guidelines on which to examine the quality of the PHR and EHR. The guidelines referred to in this study are used to assist practitioners to make appropriate health care decisions in different circumstances in a GP setting, but also to ensure uniformity and reliability of clinical data [23]. Some limitations were evident; despite undertaking power calculations to ensure we reviewed sufficient records, few studies existed from which to draw these informative statistics. The introduction of the EHR did bring about discrepancies in data entered due to changes in data entry labels as seen in the alcohol assessment field. This was recognised and accounted for, although analysis of the recording of this variable could not be considered an accurate assessment of alcohol consumed. Also, the update of national guidelines resulted in adjustments of variables included and subsequent adjustments were made to the denominators in the analysis. An additional aspect of the study demonstrated that while the data were extracted based on relevance according to guidelines, there was no consultation with women to gain a perspective on the requirements they would like to see in a maternity EHR. Further research into preferred personal access by pregnant women would give more insight into completing the picture of information important in a GP shared-care setting [2]. Additionally while data were drawn from specific fields in the EHR, this prevented

access to the 'free text' sections that were added to some of the variable data entry fields, whereas it was possible to find some of the best practice variables written in freehand locations in the PHR audit. A further limitation to introducing and optimising usage of an EHR is facilitating and enabling clinicians to have access to e-health technology. Additionally, an EHR will only be useful and have maximum potential if hospital clinicians, GPs and pregnant women decide to adopt it.

Conclusions

The PHR is a popular record keeping tool that is widely accepted by women and health care providers to document antenatal information across women, hospital and community. In alignment with the introduction of the National EHR, a South-East Queensland (Australia) MH has implemented an EHR to share data between its clinicians and GPs involved in maternity shared-care. While neither record resulted in complete capture of all required best practice variables, use of an EHR demonstrated improved access to antenatal clinical information and greater adherence to the collection of these variables. While the PHR does record best practice variables, many of these were difficult to locate in a free text form and were only retrospectively found by an audit process. The EHR has the capacity to further improve data capture by ensuring there are specific fields in which to enter an increased number of best practice variables. This study adds to an under-researched but important area of clinical data quality and is the first step in determining how to improve recording of complete, relevant and up-to-date antenatal information that can be shared between maternity health care providers and women. The experiences of health care providers using the maternity records are addressed in future papers.

Competing Interests

Authors declare that they have no competing interests.

Author Contributions

All authors contributed to study design. GH was responsible for data management, developed data extraction spreadsheet, extracted data and prepared manuscript. SW extracted data, interpreted results and contributed to manuscript. CJ assisted in interpretation of results and manuscript preparation. JH contributed to final manuscript. All authors read and approved the final manuscript.

Abbreviations

PHR: paper hand-held record, EHR: electronic health record, GP: general practitioner, MMH: mater mothers' hospital

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Chapter 5

Qualitative Approach – women

5.1 Preface

This manuscript included in this chapter comprised a study to explore the experiences of those who used the maternity PHR and MSEHR. In order to determine meaningful perspectives on using the MSEHR, phase 2 interviews were conducted one year following the introduction of the record in June 2012. The objectives of the qualitative analysis were to explore and compare women's experiences when using the PHR and MSEHR to address the second research question: 'What are the experiences of women when using the PHR and MSEHR?' A copy of the full interview schedule is found in Appendix 7.

Four themes emerged: purpose of the record; perceptions of the record; content in the record; and sharing the record. These themes are discussed from a woman's perspective.

This chapter presents a manuscript discussing the methodological background to the qualitative approach to exploring women's experiences, including participants, methods and procedure. The importance of choosing the appropriate methods to obtain information from women has been outlined in Section 2.2.4, along with the strengths and possible limitations of the tools presented. Strategies to minimise the limitations of the methods have been described in Section 2.2.6 to provide reliability to the study.

5.2 Manuscript 3

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From maternity paper hand-held records (PHR) to electronic health records (EHR): What do women tell us about their use?

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Keywords: maternity, antenatal, general practitioner (GP), paper hand-held record (PHR), electronic health record (EHR), shared-care, qualitative research

Abstract

Background: The paper hand-held record (PHR) has been used extensively in general practice (GP) shared-care management of pregnant women, and recently the first Mater shared electronic health record (MSEHR) was introduced. The aim of this qualitative study was to examine women's experiences using the records and the contribution of the records to integrated care.

Methods: At the 36 week antenatal visit in a maternity tertiary centre clinic women were identified as a user of either the PHR or the EHR and organised into phase 1 and phase 2 studies respectively. Fifteen women were interviewed in phase 1 and 12 women in phase 2. Semi-structured interviews were used for data collection, and analysed using qualitative content analysis.

Results: Four main themes were identified: 1) Purpose of the record; 2) Perceptions of the record; 3) Content of the record; and 4) Sharing the record. Findings indicate that the PHR is a well-liked maternity tool. The findings also indicate there is under-usage of the EHR due to health care providers failing to follow-up and discuss the option of using the electronic health record option or if a woman has completed the log-in process.

Conclusions: This paper adds to an already favourable body of knowledge about the use of the PHR. It is recommended that further development of the implementation process of the MSEHR be undertaken to facilitate its use.

Background

Promoting best practice in maternity care involves effective communication between health providers and women. Since the 1950s the paper hand-held record (PHR) has been an integral component of good communication and a successful tool in sharing antenatal information (1). The use of the PHR has become common; particularly in a general practice (GP) shared-care setting, or a service where care is provided between the primary and secondary sectors, with GPs as the fundamental central component (2). The PHR is carried by the woman and enables the documentation of care at each visit (3). The aim of carrying the PHR is to document data so that women can always be in possession of their information and also be available to hospital health care providers and GPs. The PHR documents physical measurements, screening and clinical assessments. Data recorded includes: weight, blood pressure and also blood (serology) and scan results. The PHR also contains information regarding smoking, alcohol consumption, visit scheduling, immunisations, birth planning and hospital contact details. Evidence shows that PHRs improve communication and collaboration between health care providers, reduces anxiety and increases women's involvement in their care (4).

The term electronic health record (EHR) is widely used in the healthcare arena and describes a system that is comprehensive, cross-institutional and collects patient data (5). Internationally, the United States, the United Kingdom and Australia in 2011, have implemented EHRs with aims to improving quality of care with shared management of patients and improving communication between patient and GP (6-10). As obstetrics is a well-defined health field with relatively standard steps of care, it is an ideal setting in which to introduce a paperless record to facilitate information between women, GPs and the hospital where delivery is expected to occur (11). Additionally, women in a maternity GP shared-care setting interact with different health care providers, requiring the transfer of information at regular intervals to be reliable and efficient (12). For these reasons the maternity EHR has the potential to enhance the integration of care between the woman and her health care providers, permit the woman to interact with her own pregnancy information and subsequently be engaged in her own care. This study aimed to examine and compare the experiences of women in a maternity GP shared-care setting using the PHR in

phase 1 and the EHR in phase 2, and describe any differences in benefits and limitations of the records.

What is known about the topic?

- Internationally e-health records have been implemented to replace paper systems but little work has been done on exploring the experiences from women in a maternity setting using these tools of communication.

What does this paper add?

- This paper adds to a body of knowledge on maternity paper and health records. Additionally it is valuable in being one of only a few papers using qualitative face to face interviews to permit accurate accounts of both positive and negative experiences using the records.

Methods

A qualitative research design using semi-structured interviews was selected to collect data about women's experiences of using maternity records across key topic areas. The interview questions contributed to maintaining the interview's direction and focus (13). The interview schedule was developed to address gaps identified from the literature (2) and was piloted with 2 pregnant women, 5 hospital based health care providers (2 midwives, 1 doctor, 2 allied health) and 2 GPs. The study was conducted in two phases: phase 1 included women who had used a PHR, and phase 2 included women who had used the MSEHR. A purposive homogenous sampling approach was chosen to enable the collection of information-rich data about women's experiences from a sample with similar demographic factors and where the major difference was the type of record they had used (14). Ethical clearance was obtained from the Mater Health Services Human Research Ethics Committee.

Setting and description of maternity records

The tertiary maternity referral hospital involved in the study has an established shared-care arrangement with general practitioners (GPs) who have completed an alignment program with the hospital. GPs who share maternity care with the Mater

Mothers' Hospital (MMH) are 'aligned' following an education program coordinated with obstetric advisory consultation. In a GP shared-care arrangement, low risk antenatal women visit the maternity centre routinely at booking in and again at the 36-40 week gestation period. The aligned GP manages the care of women at visits between these time periods (15).

The hospital has used a paper hand-held record (PHR) that is carried by the woman during her pregnancy as she visits various health care providers within the centre and the community. The PHR is an A4 size booklet, orange and white in colour and can be easily folded. The booklet includes the following sections: contact information, birth planning, clinical information (medical and obstetric histories, blood and ultrasound results, clinic visits) and lifestyle issues (tobacco, alcohol, drug usage). The sections have a similar format and are designed for use by all pregnant women rather than specific populations of women. An example of the PHR can be viewed in Supplementary file 1.

A national EHR was funded in Australia in the 2010/2011 federal budget and the Australian Government Department of Health and Aging (DoHA) with the National E-Health Transitory Authority (NEHTA) announced an investment over 2 years to deliver a national Personally Controlled EHR (PCEHR) (9). In wave 2 of the PCEHR roll-out, the Mater Shared EHR (MSEHR) was introduced at the MMH, Brisbane, Queensland to operate as a stand-alone system in a maternity GP shared-care setting. Following introduction at the MMH, the MSEHR is expected to be incrementally introduced into other areas of the Mater Hospital. Eventually the MSEHR is expected to link with the PCEHR. The MMH introduced the MSEHR to provide an alternative to the PHR by producing an electronic summary health record. The MSEHR aims to be a single source of information for health care providers to have the right information at the right time and enables pregnant women to participate and manage their own health care. A guide to the Mater MSEHR can be found in the following links.

An explanation of Mater Health Record: [Mater Electronic Health Record](#)

To explore the record via the woman's view: [Mater Patient Portal-Take a Tour](#)

Women access the MSEHR through the hospital patient portal using individual log-in information. The home page of the MSEHR has links to personal information, scheduled appointment, prior and present pregnancy summary information. A view of the MSEHR homepage can be viewed in Appendix 2. A comparison of features of the PHR and EHR is outlined in Appendix 6. In order for the EHR information to be shared and viewed by all users, the GP is required to have compliant software system linked to the hospital. A MSEHR project team provided training to hospital health care providers during the period of January 2012 to December 2012.

Sampling and recruitment

Pregnant women who were included in shared-care and assessed as low risk at the first antenatal visit were eligible to be included in the study. Due to study limitations, project timeline and financial constraints, non-English speaking women requiring an interpreter and those under 18 needing an accompanying guardian for consent were not included in the study. All women recruited were aged between 18 and 35 years, understood and spoke English. Homogenous purposive sampling was used to interview these women that shared similar characteristics all participating in the same model of care. Recruitment occurred between September 2012 and September 2014 and involved talking to women upon arrival at the 36-40 week clinic visit women to ask if they were interested in participating in the study. Women were provided with an information sheet, had 15 minutes to read it, were given the opportunity to ask any questions, and sign the consent form prior to participation.

Women were identified and recruited through attendance at the hospital antenatal clinic. The interviews were conducted following the visit with the health care provider in an antenatal clinic room and were approximately 20 minutes each in duration. The interviews were audio recorded and a grocery voucher of \$50 was given to each

woman upon completion of the interview. Initial target samples of n=15 participants in phase 1 and n=15 in phase 2 of the study were considered sufficient (16, 17), with the possibility of further recruitment if data saturation did not occur.

In phase 1 a total of 17 women were approached, but 2 declined to be interviewed. In phase 2, recruited women all received a log-in to use their MSEHR, although all did not access the information on the record. Recruiting to this phase ended at 12 women because data saturation occurred. No women approached declined to be interviewed in phase 2. Women were classified by pregnancy number as gravida 1, 2 or 3. (G1, G2, G3).

Interview schedule

The interview schedule was developed by the lead author in consultation with the research team (authors' initials blinded) to answer research questions, exploring the experiences of women using a PHR or EHR. An opening question was used to introduce the interview and encourage the participants to begin talking about their antenatal record (18). The remaining questions were semi-structured and designed to explore specific aspects of the PHR and EHR and are described in a condensed form in Table 5.1. The full version of the interview schedule is found in Appendix 7.

Table 5.1 The condensed interview schedule

Research questions	Interview questions and prompts
1. What are the experiences of women when using an EHR and a PHR?	<p>Tell me about the sections in the record</p> <ul style="list-style-type: none">- <i>what do you think the good things are about the paper record?</i>- <i>what parts of the record do you use?</i> <p>Are there parts of the record you don't understand?</p> <ul style="list-style-type: none">- <i>what could be improved?</i> <p>Do you think the record has provided resources for or assisted with preparation for delivery?</p> <ul style="list-style-type: none">- <i>what information do you want to find out about?</i>
2. How does the integration of care differ between using an EHR and PHR?	<p>Does partner look at record?</p> <p>Do you think the record helps to co-ordinate your care between health care providers</p> <ul style="list-style-type: none">- <i>does it assist with communication</i>- <i>is information reliable and who uses the record?</i>- <i>which of your providers have looked at the record?</i>

If further clarification in responses were required the interviewer used prompts to encourage the participant to expand their answer. The same interview schedule was used in both phases with minor adjustments made in the wording to reflect the use of either the PHR or EHR. The interviews were carried out by the lead author, who had undergone training in qualitative interviewing, and was also a qualified midwife but had no involvement in the participants' clinical care.

Data analysis

All but 3 interviews were transcribed verbatim by a professional transcription service, coded manually and analysed using qualitative content analysis (19). The field notes from the 3 respondents who preferred their interviews not be recorded were summarised for verification at the end of the interview period. No corrections to the notes were requested. The transcriptions were read repeatedly by the lead author, examined for patterns and trends of words and inter-rater reliability subsequently verified by an author who was an expert in qualitative research (initials blinded) to maximise the validity of the information (18). Interview content was classified into instances or occurrences of written material and categorised in a systematic and replicable structure as demonstrated in Appendix 8. This process provided transparency which facilitated analysis and discussion between the multiple researchers. The final coding framework was agreed to by the lead and expert authors (initials blinded) and accepted as being representative of the data. A summary of the main themes and sub-themes are in Table 5.2.

Table 5.2 PHR and EHR: Summary of main themes and sub-themes

Theme	Sub-theme
1. Purpose of the record	1.1 Preparation and reflection
	1.2 Confusion
2. Perceptions of the record	2.1 Physical attributes
	2.2 Acceptance
	2.3 Indifference
3. Content in the record	3.1 Missing information
	3.2 Irrelevant information
	3.3 Clinical results
	3.4 Resources
4. Sharing the record	4.1 Communication between the woman and health care providers
	4.2 Communication between the woman and partner/family/friends
	4.3 Communication among health care providers

Results

Theme 1: Purpose of the record

1.1 Preparation and reflection

Women reported the PHR to be an important document to record information. In terms of specific types of use, women referred to the PHR to check the dates of pre-scheduled health care visits and to prepare them for what was expected to occur at their next visits. Following an antenatal health visit women looked at the record to remind them about what had happened and/or reflect on what had been discussed with the health care provider.

It's really good, 'cause it does, it reminds you of things that you wouldn't think of, like the Vitamin K, the Hep B, all that sort of stuff. Make sure, 'cause you have to. If you don't – you need to be aware of everything, I think. You need to be prepared. (PHR participant 1, G2)

I often forget when my appointments are and at least I have a piece of paper to remind me – to refer to. I am doing the shared-care between my GP and the midwife, so at least I can follow it up. (PHR participant 6, G1)

Similar to experiences using the PHR, women using the MSEHR focused on viewing appointments, blood results and also looking back at previous pregnancy details when using their MSEHR. Women who used the MSEHR enjoyed looking at the links to inform them about what to expect in each phase of the pregnancy.

I looked at my antenatal history. I remember looking at that because that had a bit of information about what happened to me at another hospital and that my induction was there and my.... my blood patch

(from epidural) I'm sure. They had all that information and like my prior pregnancy and all that kind of stuff. (MSEHR participant 3, G2)

Women also indicated they wanted more information from the MSEHR, such as phone numbers and links to common aspects of pregnancy and delivery such as anaemia and caesarean section.

Test results too would be good like from each scanning because I just - you don't get as in-depth information. You know like the doctors do but we don't. We only get the flash over it so maybe that test result they had there you could see a little bit more in-depth what went on with your tests so the scanning. (MSEHR participant 8, G3)

1.2 Confusion

Women found the meaning of some of the record's sections confusing, and were unclear as to whether it was a tool they should be looking at themselves or intended for health care providers. Women explained that, when they were given the PHR, midwives had not talked to them about how to use the record and there was also confusion about the roles the health care providers played in explaining the PHR. Women revealed they did not fully know the intent of the record in terms of whether the PHR was applicable to them and they were expected to look at it, or if was designed for health care providers to refer to and write notes in.

When we came here they said, "Oh, your GP might have already explained everything." [Laughs]. They said, "No, it's GP's job." Then we went back to GP, it's hospital's job. (PHR participant 11, G1)

*I did look at the record but honestly thought it was for the health care people, not really for me. I didn't feel like it was for me really.....
Really just what the purpose of the record is – really didn't know.
(PHR participant 8, G1)*

Overwhelmingly when women were asked about the MSEHR, they said that they did not know much at all about how to use the record. Once access to the MSEHR was attained, women were generally confused about the next steps involved in using the record. Women indicated that the MSEHR was not discussed with them and they did not know what role the record played in their antenatal care. They also mentioned that even if they had signed up for an MSEHR, actually accessing the record did not occur and was not followed up. Even if an MSEHR was the preferred mode of maternity record, the women also received paper copies of information entered into the record.

Well, I've got the blue booklet with all the information in there and then they gave me the information about the electronic online system, which I signed up for as well, but I wasn't really – I didn't know that they were one or the other, so I've been using both the whole time. Yeah. (MSEHR participant 8, G1)

Theme 2: Perceptions of the record

2.1 Physical attributes

The PHR was described favourably by most of the women due to it being a physically convenient size and easy to use. Women had ownership of keeping the record with them and typically carried it in their bag.

Yes. They gave it to me. And I quite like that. I get to carry it with me everywhere. So it's a bit of a safety blanket, actually, because I do carry it in my handbag everywhere [laughs] just to make sure that if anything does happen I've always got that as a record...to go to whatever hospital or doctor I need to go to at the time, which is quite helpful. (PHR participant 4, G1)

Although women's experiences of the PHR were overall favourable, there were some comments about how the record could be improved. There were suggestions on improving the organisation of the PHR, encompassing the rearrangement/ordering or colour coding sections to differentiate the sections intended for women from those intended for use by health care providers.

I guess it could be colour coded... there are all of these separate bits...maybe the GP section could be blue....patient bit could be green. It is a little overwhelming looking at all those pages. (PHR participant 6, G1)

Most of the responses from women described the MSEHR favourably, and most did complete the signup process. Women reported a willingness to use the MSEHR but did not subsequently do so due to a lack of instruction or support. Women who did access the record considered the MSEHR to be the preferred option over the use of the PHR.

But yeah, look, I think it was great and I thought it would be great. But it's just like the setting up was - and that's, sort of, me to a T with lots of different things, you know? The set up and if it's too difficult you think okay, I'll just put it to that too hard basket. (MSEHR participant 8, G3)

2.2 Acceptance

Women unanimously talked about “liking” the record. These views were general in nature and detailed descriptions were not provided. Women accepted the PHR was a useful document to store information and a normal part of antenatal care.

Yeah, it's pretty straightforward. (PHR participant 3, G2)

Generally, there were very few concerns over security issues, hindering access to or using their MSEHR. Women perceived the MSEHR to be the main type of maternity record for the future.

I really wanted to have one because I always tend to forget my paper record. Having an electronic record meant that I didn't need to worry about remembering anything when I went to the doctor.
(MSEHR participant 6, G2)

It's just the way of - the way the world is going and we all have to jump on board and I think we don't have anything to hide or to - so people got all our details. It doesn't really matter. It's only really for money wise, bank accounts and those types of things we don't give people access, that sort of stuff. (MSEHR participant 3, G3)

When asked about potential issues with the MSEHR, most women said having printed paper copies of their visits and results hindered the desire or need to log into their own online record.

I mean maybe - I know it has to be secure but maybe that - people forget to get on here because they're like we've got to bring this in (PHR). (MSEHR participant 3, G2)

2.3 Indifference

As the interviews progressed, some comments emerged that were characterised by indifference towards the use of the record. Although, women thought that carrying the PHR was beneficial and an effective tool for storing and sharing information, many did not look through the whole record or in any detail.

To be honest I don't look at it ... really look through it. To be honest I really just look at the attendance page. (PHR participant 6, G1)

Once the women identified that they did not refer to all of the PHR, they subsequently indicated that they would use the record more frequently in the future.

Also similar to women's use of the PHR, some participants were completely indifferent to using the MSEHR. Women reported they did not view their record for antenatal information.

I'll have to remember now. I haven't looked at it much honestly. (MSEHR participant 6, G2)

I don't know why I haven't used it, yeah. (MSEHR participant 2, G1)

Theme 3: Content in the record

3.1 Missing information

The participants identified that in some records pathology (blood tests) and scan results data were missing, and were also unsure how the missing results were going to be found or whose responsibility it was to locate these results.

Because the radiologist, they sent records to GP not here, and GP supposed to communicate with the hospital. And she communicate via something else, rather than here (on PHR).
(PHR participant 11, G1)

In most cases the participants' GPs had copies of their results on the general practice computer systems and so the missing information was filled in by the GP. When data were missing on the MSEHR, both the GP and midwives asked women questions about where and when a test had been done.

But I do worry, my doctor is amazing but there was some stuff that wasn't updated like I looked at my blood test and I'm like I had a more recent blood test than that. It's not on here, why is it not on there? Obviously someone somewhere along the line hasn't updated it. Do you know what I mean? Yeah. And I had to call up and all that stuff. So there was some stuff missing off here. (MSEHR participant 3, G2)

3.2 Irrelevant information

Women did suggest the sections concerning questions about alcohol, drug consumption and smoking and the glossary to be irrelevant.

It's pretty comprehensive but some parts aren't applicable to me, like the tobacco and alcohol section (PHR participant 9, G1)

Such as the glossary and things, really, in this day and age, could be omitted and put online or something like that. (PHR participant 5, G2)

The women who had used the MSEHR did not identify any information on the MSEHR that was irrelevant.

3.3 Clinical results

Information that was recorded on the PHR and considered as being important clinical information by the women mostly included pathology results. Women thought these results were important to have available for themselves, hospital clinicians and GPs:

The history of results is a good thing and that it is publicly available.
(PHR participant 7, G1)

Women did admit that they had not closely been through all tabs or links on the MSEHR but did think their antenatal information was covered on the MSEHR and were interested in finding their clinical results.

I think everything in there has got all, sort of, like important things.
(MSEHR Participant 24, G1)

3.4 Resources

Apart from having access to clinical blood and scan results, women reported other resource information as convenient. Responses varied, but women found that having contact phone numbers, birth plan suggestions, the schedule of antenatal visits and what is covered (or can be expected to occur) at the visits and the record of what

happened at the antenatal appointment was helpful. The vaccinations required were also identified as being important:

I look at the phone numbers, like the assessment unit and reception.....Having the phone numbers was good..... I like the schedule in the record. (PHR participant 9, G1)

We got help there, because then I started asking GP about the vaccinations and GPs thoughts on that as well, especially whooping cough and that sort of thing so, yeah, that's, we got it from this record. (PHR participant 10, G1)

Women overwhelmingly reported that the PHR was not the source of educational material such as birthing plans, dietary considerations or breastfeeding information. Rather, this information was obtained from other booklets or pamphlets provided by the midwives at the booking-in visit, or from attending antenatal classes:

Not so much the record, but MMH (Mater Mothers' Hospital) has given lots of...heaps of information.....I actually went to the classes for my birthing information. (PHR participant 7)

Similar to previous results, women had not closely looked at the MSEHR and were not aware of all the information available through the links on the record. Subsequently there were very few comments about what additional resource information was available. Once the women were shown how to navigate the MSEHR and open the links, they thought the issues and plans tab was valuable to view any information that would be specific to them.

So you can actually put your own (birthplan) - okay.

The health and information one? This is great. I have used this. I have used this. I thought it was really, really good. So yeah, this is great.... I mean it's pretty good. I mean you've got messages in there as well. (MSEHR participant 3, G2)

There was a suggestion that information about alternative medicines or advice about visiting holistic practices of naturopathy be included as a resource of information:

Naturopath, because a lot of people go to naturopaths for herbs as well for this. I mean maybe that would be a good idea because a lot of people don't know should we go to an acupuncturist to help with - are we allowed to, that kind of stuff? So if it had information about that on here maybe promoting it. (MSEHR participant 3, G2)

Theme 4: Sharing the record

The participants talked about how they used or did not use the PHR as a communication tool in relation to sharing information: (1) between women and their health care providers; (2) between the health care providers; and (3) between themselves and their partners/family/friends.

4.1 Communication between the woman and health care providers

Several participants discussed the PHR as a communication tool that was used between themselves and their GPs in that the GP would read and record information in the PHR and explain parts of the record to them.

I think it was with the doctor, she explain us....the GP. She said there's got to be a bible for the whole pregnancy and so the GP knows what's going on in the hospital for her. Yeah.. They (the GP) always go through that. Yeah. (PHR participant 11, G1)

Interestingly, women overwhelmingly considered the MSEHR as a helpful tool in integrating information between themselves and their GP. There were also suggestions that the MSEHR was useful for GPs, as they could view information easily, did not have to write on paper and could update information during the antenatal visit.

When I'm there, yeah. So she'll look at it and then she'll update it while she's there as well and make sure that everything's on there so when I went into the appointment just now, everything was updated from my GP.(MSEHR participant 3, G2)

Conversely, some women indicated that the GP did not utilise the MSEHR at the antenatal visit or even discuss the record with women. As women using the MSEHR still receive a smaller, fragmented version of the PHR, GPs would refer to this record or more often just use their own practice systems.

Yes. My GP's never asked if I used the log in instead of this. I don't know if they know. (MSEHR participant 9, G1)

If information was missing or the woman had had been an inpatient and notes not provided, the GPs would make phone calls, check for facsimile reports or ask the woman what had occurred.

4.2 Communication between the woman and partner/family/friends

Women gave varied responses regarding if and when they shared information contained in the PHR with their partners/families/friends.

Partner does not look at (laughs). (PHR participant 7, G2)

Most of the participants simply stated 'no' in a humorous tone of non-interest and even when probed about why their partner did not look at the record, did not have a reason.

As women had not utilised the MSEHR, women had mixed views on the role the record would play in communication between partners or family.

Really don't know if he would or wouldn't. (MSEHR participant 5, G1)

Yeah, maybe, because then he's – they're always on there, saying he's looking at stuff, anyway. So I think he's more of a – instead of going through all the paperwork he probably would like that, he'd just sit in there, have a quick look through and, yeah, maybe get more involved. (MSEHR participant 7, G3)

4.3 Communication among health care providers

Responses overwhelmingly indicated that the PHR assisted with sharing information between the hospital and the GP. Women made it clear that they thought the PHR assisted communication between health care providers and referred to the example of GPs looking at the record to see what information had been recorded by the hospital care provider.

I thought the record was good for communication – helped to communicate between here (the hospital) and the GP.....It records information. I think it records information well and the GP reads the record. (PHR participant 10,G1)

Other women did have views encompassing that the GP did not show an interest in the PHR and that the record was perhaps more valuable for the hospital providers:

I think it helps the hospital, but not the GP [laughter].....I don't think the GP, probably just because they're separate, is much more focused on the immediate; you're here seeing me today and at this point in time you're fine. They're not, perhaps, so interested. (PHR participant 5, G2)

One woman did talk about the MSEHR assisting the communication between health care providers. The GP could view information about the pregnancy and also update it at the time of the antenatal visit. The record also assisted the hospital providers to ascertain what had happened at the GP visit.

When I'm there, yeah. So she'll look at it and then she'll update it while she's there as well and make sure that everything's on there so when I went into the appointment just now (at the hospital), everything was updated from my GP. (MSEHR participant 3, G2)

At the hospital antenatal visit, women were aware that the midwife was viewing and entering information on a computer, although they did not know this information populated the MSEHR.

Interestingly, the MSEHR was overwhelmingly viewed as a helpful tool in integrating information between themselves and their GP. Also women suggested that the MSEHR was useful for GPs, as they could view information easily, did not have to write on paper and could update information during the antenatal visit.

Discussion

The aim of this study was to examine women's experiences from women using the PHR or the MSEHR during their maternity care and the records' contribution to integrated care. Four main themes were identified around the benefits and limitations of the records and how the records have assisted communication between themselves and their health care providers. The themes include: 1) the purpose; 2) perception; 3) content; and 4) sharing of each of the records. We conducted the study adhering to established criteria for conducting qualitative research (14, 16, 19).

Purpose of the records

This study demonstrated several commonalities in the experiences of women in the PHR group with those reported in the literature. Studies have identified that the PHR gave the women a sense of satisfaction and a feeling of ownership over their pregnancy (3, 4, 20-25). Although the MSEHR was not utilised to full capacity, it was reported to be a positive initiative which is supported in the literature where women appreciated the opportunity to prepare for or to reflect on visits (26-28).

Confusion

There were some interesting findings in this study that have not been cited in the literature. Although women described the PHR as a document that they liked and thought was useful, after more detailed discussion it was found that women were confused about what the real purpose of the PHR was and the role they played in the use of the record. Furthermore, there

were sections of the PHR that were not explained well to the women in terms of relevance and interpretation (e.g. of blood results) by the midwife at the hospital booking-in visit or with the GP at subsequent visits. Women did not consider themselves to be the focal point of the PHR but rather a carrier of information between the hospital and the GP. The PHR has also been reported in the literature to be advantageous in allowing a woman's partner and family members to view pregnancy information (3, 22, 25). In contrast this study did not support the literature (4, 21) and overwhelmingly, women said that their partners did not look at the record.

In the GP shared-care model, not all women had a GP who was connected to the MSEHR, yet all women were given the option to have access to their MSEHR. However despite obtaining a log-in, these women did not access their MSEHR for maternity information. This was due to both GPs and hospital providers not promoting or engaging with the woman using the MSEHR and not recognising which record the woman had nominated to use. Subsequently when women were given printed paper copies of their antenatal visit information, there was no need for the woman to refer to the MSEHR.

Perceptions

Findings in this study are consistent with the literature that overall, women described the PHR favourably and easy to use (3, 4). Additionally, women's positive experiences using a maternity MSEHR have been reported in the literature (26, 29, 30). Even though few women had viewed their MSEHR in this study, they nevertheless thought the record was a good initiative and had the potential to be a beneficial tool in communicating antenatal information. These women demonstrated that they were eager to have access to and view their pregnancy information electronically.

Content

When information such as blood tests and scan results were missing, women were unsure how the missing results were going to be found or whose responsibility it was to locate these results. Additionally the study has reinforced previous work which found that, when data was missing from the MSEHR, women were expected to recall information (30). This was noted even by the few women who had used the record. The literature also cites women having some concerns over security and confidentiality using an EHR (26, 29, 30). However women in this study, even when probed about potential security violations, did not express concerns.

However the study did identify that those women who had accessed their MSEHR, found it a valuable tool for communicating hospital visits, pathology results, any pregnancy issues identified, birth plan options and links to pregnancy information.

Sharing the record

When determining if there was one maternity record which improved integration of care, the literature and this study reinforces that the PHR is a successful initiative to communicate information between women themselves and health care providers in a GP shared-care environment (3, 4). Although the PHR was considered to be a valuable source of information to the GP, this study suggested that important data such as the results of scans and blood tests were not written on the record. Rather the GP referred to their computer system or was required to call the laboratory for these results.

For the MSEHR to be able to fulfil a role of being a tool to facilitate integration the GP as a key link in the shared-care model, needs to have reliable link to the MSEHR and also be routinely accessing and using the record. If the GP has not opted to use the MSEHR, it is unlikely the electronic record will facilitate the three way communication between

themselves, the woman and the hospital. The issue of EHR adoption is not unique to this study. The national EHR has been launched as an 'opt-in' model (or the adoption to use the EHR if interested), for both the GP and the patient he/she would see in their practice. However health experts suggest that the best option for implementation of a successful national EHR would be to adopt an 'opt-out' model (both GP and patient would all have an EHR and decide not to participate if not interested) model (31). As privacy concerns have not dominated this research, the suggestion of an 'opt-out' model for GPs aligned with the hospital could facilitate a greater number of women using the MSEHR. Both hospital providers and GPs need to have continued training on using the MSEHR. This training is a MMH organisational responsibility and should be provided on a continuing basis. Additionally, providers need to take the time to engage woman by viewing the record from her woman's perspective. Even with this training, in order for the hospital providers to promote the record to the women they need to embrace using it themselves.

Strengths and limitations

While other studies included in the literature utilised survey methods to obtain information, this study has utilised face-to-face interviews to utilise discussion with rich and meaningful insights into using health records. However as women in the study did not access the MSEHR, it is difficult to make any assertions about the role of the record in facilitating integration of care or communicating information. After ongoing training to ensure health care providers are aware of the MSEHR, including perspectives important for women, questions asked in this study could be re-visited in future research. Most importantly, determining what women want and would find most useful from an EHR would provide valuable insight into the future design of a maternity record.

Conclusion

While the MSEHR was implemented as an option to the PHR with intentions to improve the sharing of quality and timely information by health care providers, lack of use has prevented this from occurring. Further work is needed to encourage engagement of women and their health care providers. When this has occurred, then a more productive comparison of the acceptance of the two records could be made. Research to examine health care provider perspectives has been published and will complement this paper. Together it is anticipated that these studies will contribute to developing immediate and long term strategies that will facilitate improvement in accessing and utilising the records.

Supporting Files

Supplementary File 1. – PHR (paper record attachment) - Appendix

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

GH obtained ethical approval and governance, recruited women, conducted interviews, analysed the data and wrote up most of the findings for publication. CJ secured funding for the study. CJ and SW were members of group who conceived the study and made extensive review of final manuscript. JH supervised the qualitative process (methodology, coding and analysis), co-read transcripts and made extensive review to the final manuscript.

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Chapter 6

Qualitative results from health care providers

6.1 Preface

Promoting best practice in maternity care involves effective communication between health care providers and women. Because obstetric care can span a variety of outpatient and inpatient settings, communication between different medical providers is of prime importance. In Australia, a maternity EHR has been trialled at a tertiary referral hospital (MH), with the intention to link with the national PCEHR in the future. This study compares the experiences of health care providers using the trialled EHR and the previously used PHR to determine any differences in access to information, benefits and limitations of using the record, satisfaction and integration with other health care providers. The themes identified in this manuscript have emerged from interviewing hospital health care provider and GPs using the maternity records.

6.2 Manuscript 4

Hawley G, Hepworth J, Jackson C, Wilkinson S. Perspectives from health care providers: Does integration of care differ when using a maternity paper (PHR) or electronic health record (EHR)?

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Perspectives from health care providers: Does integration of care differ when using a maternity paper (PHR) or electronic health record (EHR)?

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Introduction with background and problem statement

While the adoption of EHRs by health care providers has been sporadic to date, the wider cultural shift towards a paperless society will make the long-term acceptance of the EHR by health care providers inevitable (1, 2). The EHR offers several advantages over the paper records, with better retrieval and viewing of patient information, improvements in clinical care, efficiency and safety being predominantly cited (2-5). Electronic health records are described as medical information systems that provide legible, current and organised patient records which can improve coordination and integration of care between health care providers (6, 7). Despite the apparent advantages however, the shift to information technology in health care is proving difficult to implement with barriers cited as lack of training, lack of work process frameworks, technical challenges, lack of support and co-operation between organisational units (7, 8). With lack of organisational support also comes lack of awareness of EHR capabilities and subsequent lack of EHR use (9).

Internationally these issues are similar despite countries including Canada, Belgium, Denmark, New Zealand, United Kingdom (UK), United States (USA) and the Netherlands implementing their own unique versions of electronic or health summary records (10, 11). In the United Kingdom the programme for Information Technology (IT) promised to revolutionise care in the National Health System (NHS) in two years from 2003, but after 12 years the NHS has still not provided a paperless transfer of referrals, prescriptions, appointments or discharge summaries between hospital and community services. Recently the patient portal of this system was abandoned due to lack of use and subsequent concerns over the inherent and expected clinical value (2).

With the intention to transfer data and integrate care, the EHR has been introduced in many health settings. Obstetrics has been an ideal field within health care to utilise an EHR as it has well-defined and accepted standards and procedures for most types of pregnancies over a set interval of approximately 10 months, requiring outpatient and inpatient communications. Collaboration of care and sharing of

information is particularly pertinent in maternity care, as many health care providers need to coordinate their individual clinical practices around the same woman. This collaboration is essential for providing care that is coordinated beyond the abilities of an individual provider and allows inter-organisational processes to be developed with potential benefits of better health outcomes (12, 13).

Historically the paper hand-held record (PHR) has provided an effective way for pregnancy information to be documented and transferred or shared between maternity care providers, with reported advantages being safety and avoidance of duplicate investigations. However, the paper record becomes bulky, illegible and inconvenient if lost (14, 15). Internationally, electronic maternity records have been introduced using different technologies and devices, such as a Universal Serial Bus (USB) based storage or Personal Digital Assistants (PDA), in an attempt to provide higher standards of maternity care documentation (15-17). However difficulties have been encountered due to the number of different providers needing access to different datasets. Before maternity data can be shared, the EHR needs to be easy to access via a single layer of security (i.e. not requiring multiple passwords), be able to accept free text, use internationally standard fields and provide the ability to highlight the most important entries (18). Not until these requirements are met, will the maternity record move away from the familiar PHR.

In Australia the e-health project began in the year 2000 and in July 2012, the Personally Controlled Electronic Health Record (PCEHR) was released. Australia was considered to have the required technological capabilities to implement a national EHR, with more than 95% of general practitioners (GPs) having access to the internet in their practice and using a patient electronic medical record, with also more than 85% of Australians widely using the Internet (19). The PCEHR shares some similarities with the UK system and was designed to provide a secure online summary of health information for providers to view and share, with the content and permission being controlled by the consumer or patient (20). Also similar to the UK experience, the PCEHR has problems, including: medical practices still waiting for

updated IT infrastructure, inoperability issues, unintuitive controls with multiple log-ins and inconsistencies in data denominator entry (10, 19, 21, 22).

Despite the introduction of the PCEHR, communications between health care sectors are still paper-based, with strategies to improve processes and supply deliverables still written in guidelines or 'as ideas' in a spreadsheet (23, 24). As part of the national strategy, a tertiary maternity referral hospital, known as Mater Health Services (MH) has implemented a pilot version of the PCEHR, designed for maternity patients (25). The goal of the Mater Shared EHR (MSEHR) was to improve communication and integration between healthcare providers (hospital providers and General Practitioners) and pregnant women, enabling safer care and enhancing the quality and timeliness of the health information shared, through provider and patient portals (26). This paper compares the previously used paper version of maternity records to the newly introduced MSEHR from a healthcare providers' perspective and discusses whether integration of care has improved through the adoption of the MSEHR.

This study explores the experiences of health care providers using both the trialled MSEHR and compares findings with the previously used PHR to determine any differences in integration of care with women and other health care providers.

Previous related work

This study forms a component of a larger body of work comparing the completeness of data collected on both the PHR and MSEHR and examining experiences of antenatal women using the records.

The quantitative component comparing data completeness demonstrated that neither the PHR nor MSEHR captured all of the required variables as recommended by national antenatal guidelines. However, the comparison between the two record types did demonstrate significant improvements in the quality/completeness of data captured when using the MSEHR. While there have been studies reporting on quality of data in an EHR, this was the first international study to compare quality of data between a paper based and electronic record in a hospital GP shared-care setting

(27-30).

Previous studies have reported that women 'liked' carrying their PHR as it gave them a sense of control over their pregnancy and a feeling they were more informed (31-33). However, our study has identified that women did not use the PHR to its full potential, thinking it was a tool for information transfer between the hospital and the GP. Literature reported that women who were issued their maternity records on a USB stick felt more empowered, satisfied and safe (15). Our study showed that women were keen to use the EHR but lack of engagement hindered a real evaluation of impact with use.

Research question

This paper addresses a further component of the larger project by examining perspectives of health care providers to answer the research question:

1. How does the integration of care differ for health care providers using the PHR and MSEHR?

Setting and methods

All participants were health care providers giving care to pregnant women in a maternity shared-care arrangement between the MMH and community providers. Hospital providers were employees of MH including consultant, resident and registrar doctors, midwives, allied health and midwifery managers, while community participants were general practitioners (GPs) who had completed a maternity alignment program with the hospital. This alignment is coordinated with obstetric advisory consultation and involves attending educational seminars at the MMH. In a GP shared-care arrangement, low risk antenatal women visit the maternity centre routinely at booking in and again at the 36-40 week gestation period. The aligned GP manages the care of women at visits between these time periods (34).

The hospital has used a PHR that is carried by the woman during her pregnancy as she visits various health care providers within the centre and the community. The intention of a PHR is to provide a complete and accurate and up-to-date summary of

the woman's pregnancy. The PHR is an A4 size booklet, orange and white in colour and can be easily folded. A view of the PHR can be viewed in Supplementary file 1.

The MSEHR was designed to be a secure online tool, which enables a woman to view a summary of their health information (in a health summary sheet) entered throughout the pregnancy and to add individual birth plans and any questions they might want to ask their GP or midwife/doctor at the hospital. In order for the MSEHR information to be transferred and viewed by all users, the GP is required to have a compliant software system linked to the hospital. The MSEHR is accessed by women through the hospital patient portal using individual log-in information. A view of the MSEHR home page and the MSEHR health summary sheet can be viewed in Appendix 2 and 10. A comparison of features of the PHR and MSEHR is outlined in Appendix 6.

A shared maternity care model in Queensland

Once a pregnancy is confirmed by a participating GP, a referral is sent to the aligned hospital and the collaboration process commenced for that woman. The GP takes a medical and obstetric history and orders antenatal blood tests, which will also be available by the date of the first antenatal clinic visit at the MMH. Prior to the introduction of the MSEHR, at the 'booking in' MMH visit a PHR was commenced for the woman and the midwife records a medical and obstetric history, as well as lifestyle information such as immunisation, smoking and drug intake. After the introduction of the MSEHR, women elect to use either a PHR or the MSEHR to document pregnancy information. At the 'booking in' visit the hospital doctor would also see the woman, review her history and decide with the women if GP shared care was the most appropriate model of care. All subsequent care is with the GP practice until 36 weeks when the woman presents at the MH and discussions about the preparation for delivery and information provision takes place. At any time during these visits, a referral can be made to an allied health care provider. At each of these visits and with each healthcare provider, it is ideal that pregnancy information is available to ensure that correct assessment and safe management and integration of care can occur with the woman and other healthcare providers.

Sampling and participants

A purposive homogenous sampling approach (35) was chosen to enable the collection of information rich data from the experiences of the health care providers. Characteristics of the providers can be found in Table 6.1. As the phases of the research were conducted one year apart, it was possible for participants to be interviewed about using a PHR and then a MSEHR, after it had been introduced. Hospital focus groups were arranged through a 'champion' for that particular group, who invited and liaised with possible participants. General practitioners were invited for interview by practice managers of their clinics. The potential participants were provided with an information brochure at least a week prior to the interviews and the day before the interview were contacted via email and given an opportunity to clarify any issues or questions with the study. At the focus group or interview, the participants were asked to sign a consent form. Full ethical approval has been granted from the MMH Human Research Ethics Committee (reference number 1902M).

Table 6.1 Focus group and interview participant characteristics

	Using PHR		Using EHR	
	Participant No.	Role	Participant No.	Role
Hospital providers				
Focus group 1	1	Dietitian	1	Physiotherapist
	2	Occupational therapist	2	Occupational therapist
	3	Social worker	3	Dietitian
	4	Social worker	4	Social worker
	5	Psychologist		
Focus group 2	1-7	Antenatal clinic midwives	1-14	Antenatal clinic midwives
Focus group 3	1-6	Birthsuite midwives	1-4	Birthsuite midwives
Focus group 4	1-6	Midwifery clinical managers	1-4	Midwifery clinical managers

Focus group 5	1,2,4,5,6,10	Hospital registrars	1,2,3,5	Hospital registrars
	3,7,8,9,11	Hospital consultants	4	Hospital consultants
Total	36		33	
General practitioner				
Face to face interviews	1-2	Practice K	1-2	Practice G1
	1-2	Practice I	1-6	Practice M
	1-3	Practice W	1-3	Practice J1
	1-5	Practice S	1-3	Practice J2
	1-2	Practice A	1	Practice G2
	1-2	Practice B		
Total	17		15	

Interview schedule and data collection

The interview schedule was developed by the lead author in consultation with the research team (authors' initials blinded). The interview questions were semi-structured and designed to explore specific aspects of the PHR and MSEHR, as outlined in Table 6.2. If clarification was required the interviewer used prompts to encourage the participant/s to expand on the answer. The same interview schedule was used in both phases with minor adjustments made in the wording to reflect the use of either the PHR or MSEHR.

The interviews were carried out by the lead author, who had undergone training in qualitative interviewing, and was also a qualified midwife but had no involvement in the participants' clinical care. The interviews were piloted with 5 hospital based health care providers (2 midwives, 1 doctor, 2 allied health) and 2 GPs, prior to the study commencing.

Hospital health care providers were interviewed in focus groups located in a conference room at the MMH, while GPs were interviewed in their own local community practices. Focus group interviews were considered advantageous for the hospital providers because they practiced in common ways in the context of a

shared-care model. The size of the groups was flexible and considered acceptable with 6-8 participants (36). With reference to the literature, a sample number of 5 focus groups of hospital providers and interviews from 15 GPs were considered sufficient to be included in both phase 1 and phase 2 of the study (35, 37). All target focus groups and GP interviews were conducted with data saturation being achieved. Responses from the hospital health care provider focus groups and the GP interviews were audio recorded and transcribed by an independent person outside the study team. An experienced moderator also assisted with the interviews and a journal was kept to document additional information. The focus groups took up to 60 minutes in duration, while the individual GP interviews took 20-30 minutes. While every attempt was made to interview GPs entirely on an individual basis, there were occasions where recordings from 2 GPs overlapped with each other, either at the beginning or the end of an interview.

Table 6.2 Concise interview schedule

Research question	Interview questions and probes
1. How does the integration of care differ for health care providers using a PHR and the MSEHR?	<p>Tell me about the sections in the record:</p> <ul style="list-style-type: none"> > What do you think the good things are about the paper record? > What parts of the record do you use? > Are there parts of the record you don't understand? > What could be improved? <p>Do you think the record has provided resources for or assisted with preparation for delivery?</p> <ul style="list-style-type: none"> > What information do you want to find out about? <p>Do you think the record helps to co-ordinate your care between health care providers?</p> <ul style="list-style-type: none"> > Does it assist with communication? > Is information reliable and who uses the record? > Which of the providers have looked at the record?

Data analysis

The interviews were transcribed verbatim by a professional transcription service, coded manually and analysed using qualitative content analysis by the lead researcher (38). The coding analysis was examined by an experienced co-researcher to maximise the validity of the information and was used to examine text for patterns and trends of words (38, 39). Interview content was classified into instances or occurrences of written material and categorised in a systematic and replicable structure. The content was tabled in grids following the same structure as seen in Appendix 8. To ensure validity transcripts were compared across the health provider groups for commonalities and exceptions. A summary of the main themes is presented in Table 6.3.

Table 6.3 Summary of main themes and sub-themes

Theme	Sub-theme
1. Selective use of records	1.1 Specific role needs
	1.2 Sensitive nature of information
2. Communication of care	2.1 Lack of engagement
	2.2 Missing information
	2.3 Modification of design
3. Negativity using the records	3.1 Frustration
	3.2 Disconnection
	3.3 IT issues

Results

In the following presentation of results the data were examined for how, or if at all, the PHR and MSEHR facilitated integrated care: (a) between health care providers and women, and (b) among health care providers themselves. Three key themes were identified.

Theme 1. Selective use of records

Health care providers used the PHR and MSEHR to meet the needs of their specific roles in the care of women. As demonstrated in the following section, this specific usage illustrated how they perceived the records primarily from the perspective of an individual health care provider rather than as a team care tool.

General practitioners predominantly considered the PHR as being useful for writing antenatal visit notes and checking the antenatal visit schedule. Specific parts, such as screening for smoking and drug use, were considered superfluous and not looked at by some GPs because they considered those areas were already covered by the woman's existing relationship with the hospital.

Look at schedule ...and the visit notes, yes. I can't say that I do look at screening parts. This is the role of the hospital. (PHR Practice A, Dr 3)

I think the paper one, I think, is still useful but it should streamline a fair bit and the most important bit from the clinician point of view is the visit, the communication and then the history. (PHR Practice I, Dr 2)

Consequently, writing on the PHR would result in duplicating events that had already been discussed at the MH visits.

Similarly, GPs who accessed the MSEHR were also selective about which sections they viewed and these were largely blood results and scan reports from the MH.

I understand that everything is available but I've really only gone in to look at pathology or x-ray reports and those sort of things. (MSEHR Practice M, Dr 1)

Midwives were unequivocal that the PHR was a fundamental tool to share information with other health care providers and when used effectively actually facilitated the continuity of care for women. Midwives checked the PHR for GP visit

notes, or any other recorded correspondence, and to find out if clinical results had been transcribed onto the record.

*They can have continuity of care based on this document (the PHR).
(PHR Birthsuite midwife, Participant 3)*

However midwives were also aware that GPs did not always write in the PHR, and instead entered information onto their own general practice systems which hindered the effective use of the record.

Most of the time they write in their practice computer systems. That is why there is not much in there. (PHR Antenatal clinic midwife, Participant 4)

For the hospital doctors, the records were not a significant feature of their practice, but, once again; when the PHR was used it was done so to serve the needs of the specific health care provider.

There are more and more pages of stuff that I don't really care about. I do care about them, but there are pages not relevant to me as the obstetrician. (PHR, Hospital Doctor: Obstetrician)

For those health care providers who come within the category of allied health their use of the records was severely compromised by the lack of design for use by non-medical care providers and the sensitive nature of some of the information, which require large transcripts of information to be hand-written in the medical charts. Consequently, allied health care providers reported having to rely on patients to tell them about any issues affecting their health and care.

For GPs and hospital doctors the use of records was specifically aimed at meeting their information needs indicative of their approach as one of an individual clinician rather than as part of an integrated care team involving a breadth of diverse health-related information. Midwives perceptions of the records on the other hand illustrated

a broader, team approach as they included descriptions of their own use and information as well as how other health care providers used the records or were excluded due to the records' poor design.

Theme 2. Communication of care

A key difference between the use of the PHR and MSEHR for GPs was that the PHR served an important function as a checklist of the topics to cover at each visit. In this way the PHR was a key repository of schedules and information communicated to the GP and in turn with the woman.

So when I do have a pause moment and think what have we done, I can always go here (antenatal schedule usually in blue folder) and go, yes, and do either a mental or a literal tick. But with the electronic one I don't have that. (MSEHR Practice M: Dr 3)

Similarly, midwives routinely used the PHR as a prompt to ask women about their pregnancy and to collect notes on their delivery and immediate postnatal preferences.

If you see her for the first time you can see what has happened, you can see what she has been involved in. You can use it as an educational tool. (PHR Antenatal clinic midwife: Participant 5)

However when the woman forgot her PHR, this would be disruptive to the visit interaction and even considered irritating.

I can remember women turning up without their records. It was annoying. (PHR Antenatal clinic midwife: Participant 4)

In the excerpts above the midwives clearly illustrate the regular reliance that they have on the PHR as a tool to communicate care with women.

Midwives perceived the MSEHR as being more advantageous than the PHR because they could enter and retrieve data and share this information at any time.

Their blood results, we can see their blood results if we put them in. If someone (a woman) gets a Glucose Tolerance Test back and we put it in the computer on the same day, they (the women) could ring us at night. (MSEHR Birthsuite Midwife: Participant 1)

The MSEHR was therefore regarded by midwives as having the potential to contribute to more informed and safer care for women by improving documentation and communication between themselves and other health care providers.

I frequently get phone calls from GPs. I have got her sitting with me and I have no idea why or what is happening. At least I can bring it up and talk to them. (MSEHR Midwifery manager: Participant 1)

Like midwives, some hospital doctors expressed their concern about consultations where women may not have their PHR because the hospital did not store duplicate copies.

The biggest limitation is if the patient loses it in a shopping centre at 36 weeks and she turns up at her 37 weeks visit; we have no record of the previous visits, absolutely no record. (PHR Hospital Doctor: Participant 3)

For allied health care providers, particularly psychologists and social workers, documenting sensitive information, such as drug use or domestic violence, in maternity records presented difficulties because of the risk that these notes could be accessed by the woman's partner or family.

Some women are not sharing with their partners. They won't tell them that they are seeing psychology. They wouldn't have access to psychology information – not anyone in the home would have access. (PHR Psychologist: Participant 5)

These excerpts illustrate a lack of integration among health care providers' communication about care for two main reasons. First, there was no agreed, comprehensive team approach to who should be entering or acknowledging receipt of data entered. Second, the design of the records, particularly their potential availability to a woman's partner and/or family members, excluded allied health care providers' from entering information.

Theme 3. Negativity about use of the records

Although the use of the PHR and MSEHR during consultations was perceived as having both advantages and disadvantages in communicating with women and with other health care providers, health care providers had a distinct set of concerns about the records that indicated their uncertainty and negativity towards their use.

Discharge summaries are hit and miss. However, what I would say that would be usual is the patient would come and say I had a bleed last week, presented to ED. (MSEHR Practice G: Dr 1)

Receiving hospital inpatient or discharge summary information was perceived as being at best tedious, time consuming and 'ad hoc', and, at worst, in some instances, failed to inform GPs of significant maternal events such as a stillbirth. GPs were unanimous in the view that the MSEHR had not improved the integration of care in terms of sending referrals or receiving discharge summaries and these processes remained paper-based.

GPs also expressed frustration about IT related issues that impacted their use of the MSEHR. They experienced unreliable IT connections, access as a tedious and time consuming exercise, and perceived themselves to be ill-equipped and unsupported by readily available IT solutions. These GPs as early adopters of IT could see the future benefits the MSEHR would provide.

But before that, accessing the EHR wasn't just a type numbers and a minute later the portal is up. It was a - I call it the twirly-whirly. You sit there and watch the circle go round - - - (MSEHR Practice G: Dr 2)

Yeah. I love it. To me, it's simpler, it's quicker, I don't have to double enter as such, but there are still some bugs for us to sort out and I'll be looking forward to seeing diabetes information in there as such, but there's still some bugs (IT issues) to sort out. (MSEHR Practice M: Dr 3)

Midwives were not aware of the view women could see if they logged in and consequently did not envisage the potential or purpose of the EHR. Midwives often referred to needing further education.

I think we need education. Now that we are all over the initial, how to put the data in part, we need to go back and talk about accessing electronic health record. (EHR Midwifery Manager: Participant 4)

Similar to GPs, hospital doctors perceived the PHR as including too much information for women to comprehend, and thought it unlikely that women referred to the record between visits.

I don't think they read it. You go, "Scheduled visits...", they say, "What?" Mostly, they have been overwhelmed with all the bloat, and maybe don't get out of it as much as they should. (PHR Hospital doctor: Participant 4)

The MSEHR was regarded as a better mechanism than the PHR for the transfer of information but in its current version, produced a generic health summary and gave access to generic health advice sheets. Modification was needed to allow the EHR to be more accommodating to the needs of the woman. Doctors showed an enthusiasm to work with the design of the EHR to allow data entry to be personalised to allow specific information to be uploaded as appropriate to the woman. Currently, the

MSEHR did not have the functionality to indicate which data entered could be shared with women and there was no flexibility in the data output allowed.

That would be handy for results acknowledgment. You could send them who an e-mail saying, "I have uploaded some information to your portal." Send them a hard copy letter to say, "Get online, have a look at this information." (MSEHR Hospital doctor: Participant 5)

If you want them (women) to use it, you have got to make it fun. You have got to have an app or something for them to do. (MSEHR Hospital doctor: Participant 2)

In order for the PHR to be an effective tool for integrated care, hospital doctors made it clear that written input by all health care providers was necessary. In terms of particular health care providers, hospital doctors identified GPs and allied health care as not contributing input as fully as possible.

To my knowledge I don't - it doesn't seem to me that GPs are adding information into that when they are shared caring. I have never seen a person on shared care have anything - presumably that should come up on Verdi. I saw it once and I was like, "What is this?" (MSEHR Hospital doctor: Participant 3)

Both midwives and allied health care providers expressed a lack of enthusiasm with using the records. Midwives indicated they felt disconnected with the MSEHR as it removed them from forming a relationship with women at each antenatal visit.

During the antenatal visit, midwives needed to enter data into the EHR database, consequently taking eye contact away from women and instead moving attention to the computer screen. Additionally during the visit, a copy of the notes are printed and given to the woman. This reduced the time spent with women and simply regarded as a task to complete.

Before the MSEHR, you had time to spend with that woman, quality time. I am more concerned about getting the right printout on Verdi

(MSEHR database viewer). It is breaking my heart as a midwife, I am spending a lot less time with the woman. (MSEHR Antenatal clinic Midwife: Participant 12)

Allied health expressed a disconnection with women and health care providers, because they were not included in the consultation process for the design of either the PHR or the MSEHR.

It is not tailored to us. We only found out about it after it was implemented. (PHR Social Worker: Participant 4)

It is not about not having paper (or not having access to the MSEHR). We need a way of communicating because it is hard to page and get on to somebody and there is waste of time. It is having a method, whether it is electronic or not, having a method to communicate to let them know important information; it doesn't matter how. (MSEHR Physiotherapist: Participant 1)

Impressions from allied health indicated they felt disconnected from using both the PHR and MSEHR. This group were not consulted in the design or implementation process of the PHR or MSEHR

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Discussion

Integration of care is a fundamental premise in the model of GP shared care (40, 41). This study identified three emerging themes in relation to the effectiveness of the EHR for this purpose: 1. Selective use of the record, 2. Communication of care and 3. Negativity surrounding use of the record. These themes illustrate how different health care providers use the paper and/or electronic records to varying degrees and how their use contributes to the integration of care with women and among providers.

Selective use of records

While Australia was relatively slow to adopt maternity PHRs, health care providers have now been using the PHR in various forms for 20 years (32, 42). The PHR started as a small abbreviated card of concise information but has evolved into a lengthy document, with sections for different maternity care providers. Although the PHR is considered to be the primary source of maternity information during a pregnancy, this study identified that different health care providers felt responsible for only their own aspect of the record. GPs and hospital doctors were predominantly interested in clinical sections, while midwives tended to address the PHR in its entirety. This is due to midwives having a longer consultation time and additionally, a different relationship with the woman than the GP. Both hospital doctors and GPs wanted modifications done to the PHR to reflect their clinical needs. The use of colour coding for different providers and for the woman has been suggested.

The challenges of implementing a hospital EHR in conjunction with a GP practice system or when PHRs are still being used have been highlighted in this study and are consistent with prior studies in this area (15-18, 24). The MSEHR was developed from an existing hospital database and the software required to access the MSEHR was provided to GP practices. However when GPs were required to use their own practice database systems and then log into a hospital system to share information, this double effort resulted in time pressure on consultations. Additionally, neither the PHR nor the MSEHR cater for the needs of allied health providers, who have specific data entry requirements; a physiotherapist might need to draw a diagram, a dietitian might need to write a diet plan and a psychologist may need space to write lengthy but sensitive, confidential notes. While this was noted as a deficiency in the consultation process, allied health providers remained enthusiastic about using the MSEHR. Literature supports allied health as benefiting from using EHRs and promotes involvement from this group of providers (43).

Communication of care

Although the shared care model implies that health care providers work as a co-ordinated integrated team, this study found that use of the PHR and the MSEHR did not facilitate this practice. Individual providers relied on the PHR as a tool to prompt for information and found the tool more effective for this purpose than the MSEHR. This is reassuring for the role of the PHR in the maternity shared-care as the model has been built on the premise of integrating care around the woman. Specific guidelines have been written to incorporate both the doctor and midwife models of care into a collaborative approach to managing maternity care (12, 13, 41). The model aims to have these two groups providing woman centred care that considers the needs of other providers and the woman (13). However when information was selectively recorded or not recorded on the PHR, both midwives and hospital doctors felt that the document displayed a story of disjointed, non-integrated pregnancy care. The study also found that missing information resulted in time spent following up issues by asking women to recall details of their pregnancy, along with phone calls to laboratories, GP practices or hospital clinics. This issue was common to both the PHR and the MSEHR and was also apparent in other studies (15).

Another key feature of the integrated care model is the discharge summary, which has remained paper-based despite introduction of the MSEHR. Although the MMH has been conscious of the need to integrate summary discharge information into the MSEHR, this has not been realised. In comparison, the national PCEHR provides the ability to link or upload discharge summaries (44).

Negativity using the records

The continued use of paper alongside the MSEHR caused frustration with hospital health care providers and is an obstacle to realising the full potential of the MSEHR. Although functional, the MSEHR is not used by most health care providers, with the key impediment for GPs being the tedious, multi-layered log-in process, along with IT connectivity issues. Consequently, GPs reported that they were not using the EHR as part of their routine care. They did indicate however that they would utilise the EHR if the existing issues were resolved. Despite these negatives, doctors were

enthusiastic about the possibilities the MSEHR provides and were supportive of future efforts to improve the record.

The difficulty of designing a common record is an indication of the complexity of datasets in health and has been demonstrated in this study. This difficulty is also recognised in the national PCEHR system (19, 45). Allied health care providers reported a fundamental disconnect between the PHR and the MSEHR. This study identified that a lack of consultation with allied health care providers resulted in both the PHR and the MSEHR being inadequate for sharing information in their current forms. Both require additional data fields with adequate flexibility to accommodate allied health content. The lack of allied health data has also been recognised in the ongoing evolution of the National PCEHR, where input from allied health care providers is now being added. Similarly, recent changes have also been made to the MMH hospital database to facilitate data entry into the MSEHR by allied health care providers. This is a positive step towards the integration of allied health information with other health care data. The continued use of paperwork in addition to the EHR reduces the rate of transition to the electronic system by users. Eliminating paper would accelerate this process.

Strengths and limitations

Using semi-structured interviews has provided valuable insight into the issues surrounding the introduction of an EHR in a maternity GP shared-care setting. The findings can contribute to further research surrounding the PCEHR. A limitation was that the MSEHR was not accessed often and so a more extensive examination of the benefits and improvements in clinical outcomes could not be conducted.

Recommendations for future research

This study demonstrated the need to address the complex data requirements of different providers when designing an EHR and provided insight into the issues associated with the PCEHR (19). In a more positive sense, providers considered the

MSEHR to be the ideal way to transfer and share information. This is similar to the benefit anticipated by providers of the PCEHR (19, 46). Opening communication channels between providers enhances opportunities for improvement and productivity through interactive and more mobile e-health capabilities (47).

Designing multi-user rather than single-user work flows, along with associated training away from clinical duties would enhance the uptake of the MSEHR. Since the roll-out of the MSEHR and the PCEHR, there has been little ongoing promotion, resulting in the EHR being poorly conceived (47). Midwives also play an important role in making the MSEHR a success, being the provider group with the most direct contact with women. They also have the trust of women and are often asked to explain how the model of shared-care works. Given the large number of midwives in the system, they provide an ideal medium to facilitate the transfer of care information.

Conclusion

This study has demonstrated that despite best intentions, health care providers are not effectively sharing information using a PHR or an EHR. While the PHR will remain an integral tool for women, a redesign to more clearly differentiate which section is intended for which provider will facilitate more effective integration on the care continuum. The MSEHR examined in this study provided a useful health care summary which is ideally suited for sharing of information, however until there is a strong organisational commitment to provide a consistent multi-disciplinary framework along with continuing education, the success of truly integrating care will continue to elude health care providers.

Supporting Files

Supplementary File 1. – PHR (paper record attachment)

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

GH obtained ethical approval and governance, recruited women, conducted interviews, analysed the data and wrote up most of the findings for publication. CJ secured funding for the study. CJ and SW were members of group who conceived the study and made extensive reviews of final manuscript. JH supervised the qualitative process (methodology, coding and analysis), co-read transcripts and made extensive reviews to the final manuscript.

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PART 3: OUTCOMES

Chapter 7

Discussion

7.1 Introduction

This chapter links the results from both the qualitative and quantitative studies to answer the three research questions outlined in Table 7.1. The postpositivist paradigm and multimethod theory design were utilised, with equally important quantitative and qualitative approaches to compare the use of the PHR with the MSEHR.

Table 7.1 Research questions and associated results publications

Systematic review to inform research	1.Hawley G, Janamian T, Jackson C, Wilkinson S. In a maternity shared-care environment, what do we know about the paper hand-held and electronic health record: a systematic literature review? BMC Pregnancy and Childbirth 2014 14:52.
Research questions	Results publications
1. Does the use of an EHR improve the completeness of recorded specific evidence based best practice variables, compared with the PHR?	2.Hawley G, Jackson C, Hepworth J, Wilkinson S. Sharing of clinical data in a maternity setting: How do paper handheld records and electronic health records compare for completeness? BMC Health Services Research 2014 14:650.
2. What are the experiences of women when using the PHR and EHR?	3.Hawley Glenda, Hepworth Julie, Wilkinson Shelley A., Jackson Claire (2015) From maternity paper hand-held records to electronic health records: what do women tell us about their use? <i>Australian Journal of Primary Health</i> , http://dx.doi.org/10.1071/PY14170 .
3. How does the integration of care differ for health care providers using the MSEHR and PHR?	4. Hawley G, Hepworth J, Jackson C, Wilkinson S. Perspectives from health care providers: does integration of care differ when using a maternity paper (PHR) or electronic health record (EHR)? <i>International Journal of Integrated Care</i> (submitted).

Although quantitative and qualitative approaches were analysed separately, the interpretive process used both approaches to compare the 'use of the maternity records' in depth. The findings from the two approaches are shown in Figure 7.1.

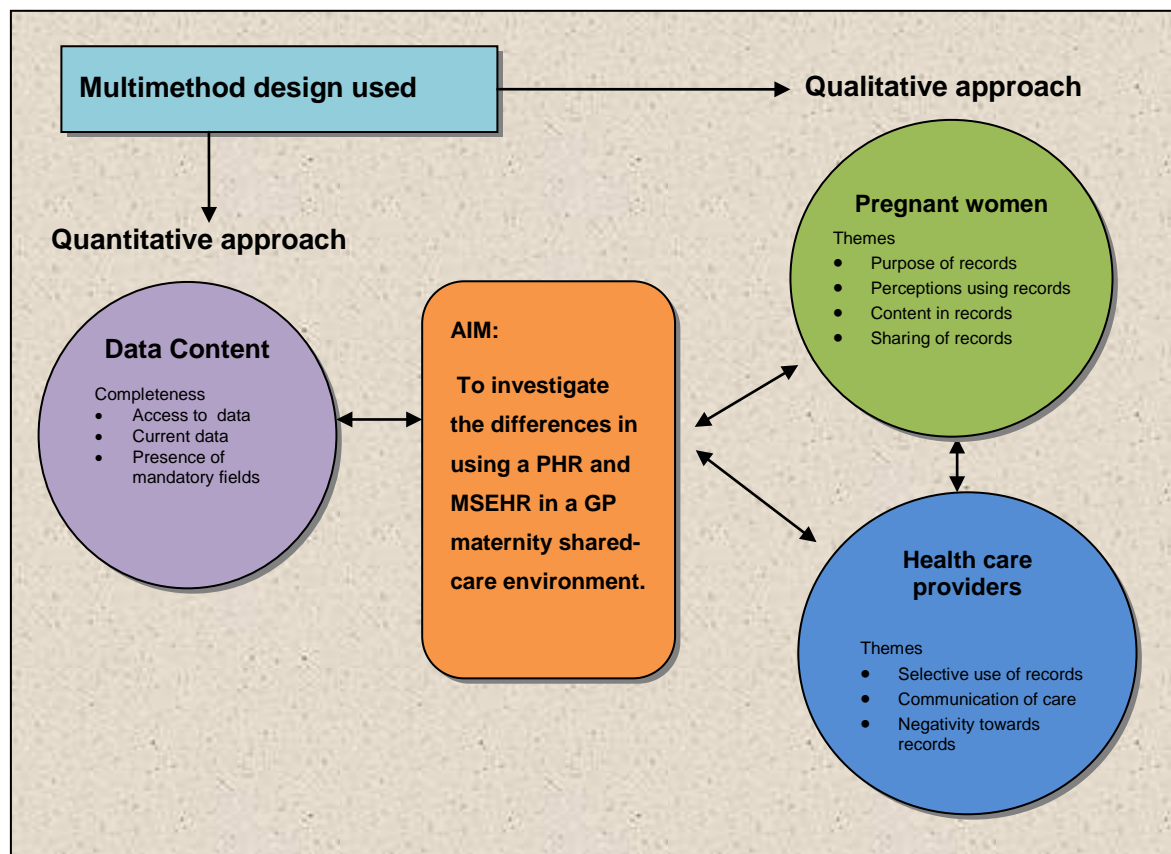


Figure 7.1 Model of the quantitative and qualitative approaches used to compare the usability of the EHR and PHR.

The figure demonstrates the comparison between the PHR and MSEHR by using a quantitative approach to examine data content for completeness and a qualitative approach to identify the themes found from women and health care providers.

7.2 Quantitative findings

7.2.1 Specific antenatal best practice variables

This study used national antenatal guidelines to identify the important specific evidenced based maternity variables. Identifying these variables as a 'standard' set of data required in maternity care allowed us to benchmark performance of the PHR and MSEHR against best practice data collected.

7.2.2 Data completeness

Neither the PHR or MSEHR captured all best practice variables, however the comparison between the two record types did demonstrate significant improvements in the completeness of data captured when using the MSEHR as shown in Figure 4.1. While there have been studies reporting quality of data in an EHR (65-68), this was the first international study to compare quality of data between a paper based and electronic record in a hospital GP shared-care setting. As reported in Chapter 4 the variables of importance that were significantly improved for completeness were antenatal scans, GTT results and immunisations recorded. Having more complete data in these screening variables fields is a positive step in detecting congenital abnormalities, occult diabetes, managing smoking and reducing caesarean section rates. Additionally improving communication is anticipated to improve maternity care and prevent the associated morbidity and possible death for mother and baby (69, 70). Huge advantages can be seen in having current and relevant data (71).

7.2.3 Availability of data

While both the PHR and MSEHR captured data usually collected at the first antenatal visit with varying degrees of completeness, this study demonstrated the indiscriminate way in which entries are written in the PHR. Information is available when documented in designated fields in the record but is difficult to retrieve if written in a blank text area. The PHR in this study demonstrated nine variables were written in a 'free text field', consequently demonstrating deficiencies in storage and easy access to important clinical maternity information.

The MSEHR demonstrated an improvement in data completeness of sixteen variables. Data was also stored in a familiar and accessible database repository.

7.2.4 Mandatory data entry fields

Additionally, this study identified and discussed the importance of mandatory data entry fields. Many healthcare settings require datasets to be complete in order to provide efficient and safe care to patients, which invariably require data that is dependable and systematic. This is reinforced in studies reporting on using meaningful and consistent data terminologies that can be used and transferred between EHR systems. These terminologies are standardised, simple to understand codes that describe health actions and outcomes (72). This study has referred to antenatal guidelines, in which standard terms have been decided on after consultation with maternity experts. The MSEHR was designed utilising these terms or codes and programmed not to allow progression to the next field until data was entered either as a drop down box choice or a text field. A similar study in an anaesthesia department, demonstrated that utilising mandatory fields was important in assuring data completeness, while not compromising usability. As long as data entry fields are context-sensitive or familiar, users did not have objections to entering data (73).

7.2.5 Data quality

Quality of data was not examined in this study and can be incorporated into further research. Determining completeness is valuable in assessing an EHR system and additional investigation into data quality would enhance the credibility of the computer infrastructure. The identification of how quality is measured has been reported on previously and includes completeness as well as accuracy (74). Again as this study utilised national guidelines, defining what the quality maternity variables are has already been ascertained.

7.3 Qualitative findings from interviews with women

There were 4 major themes identified from the group using the PHR and the group using the MSEHR: 1. Purpose of the records, 2. Perceptions using the records, 3. Content in the records and 4. Sharing the records with family and with health care providers.

7.3.1 Women using the PHR

Findings from this study reported that women referred to the PHR to prepare them for clinic visits and to reflect upon what happened at the visit. Interestingly though, there were some findings that have not been cited in the literature.

Purpose of the records

Women described the PHR as a document they liked and thought was useful, but after more detailed discussion it was found that women were confused about what the real purpose of the PHR was and the role they played in the use of the record. Women carried the PHR and were happy to do so but did not realise it was the primary source of pregnancy information available to themselves, the hospital and the GP.

Perceptions using the records

Studies have identified that the PHR gave the women a sense of satisfaction and a feeling of ownership over their pregnancy (2, 3, 75-79). Findings in this study are consistent with the literature that overall, women described the PHR favourably and easy to use (80, 81).

Content in the record

The study noted that the PHR allowed women to access pregnancy information and provide an opportunity to convey their delivery and infant feeding references. However, it was evident in this study that women did not use the PHR as a resource for helpful information on birthing preparation, breastfeeding, and links to common issues or advice in pregnancy. Women's responses suggested that this type of information was not resourced from the PHR but instead from the internet, pamphlets provided by the hospital and antenatal classes.

Sharing the record

If the PHR was lost or misplaced, both the hospital and GPs would have some pregnancy notes (stored on local computer systems), so could retrieve information. However this information would be fragmented, disjointed or missing, so leaving health care providers potentially uneasy about being privy to the whole pregnancy story.

The PHR has also been reported in the literature to be advantageous in allowing a woman's partner and family members to view pregnancy information (2, 79, 82). In contrast this study did not support the literature (3, 82) and overwhelmingly, women said that their partners did not look at the PHR. This was the same finding for women using an EHR.

This study has reinforced the usage of the PHR as a tool to promote collaborative care between women, hospital providers and GPs. However women were identified not to be using the PHR to its full potential, considering it to be a tool intended for health care providers to transfer information between the hospital and the GP practice.

7.3.2 Women using the MSEHR

Purpose of the record

Even though few women had viewed their MSEHR, women nevertheless thought the record was a good initiative and had the potential to be a beneficial tool in communicating antenatal information. These women, even with limited usage of the MSEHR, demonstrated that they were eager to have access to and view their pregnancy information electronically.

In addition, the study has reinforced previous work which found that when data was missing from the MSEHR, women were expected to recall information (83).

Perceptions using the records

Positive experiences of women using the MSEHR have been reported in the literature with studies finding women to have encouraging impressions of the EHR and considering them to be useful. (83-85). Even though few women had viewed their MSEHR, women nevertheless thought the record was a good initiative and had the potential to be a beneficial tool in communicating antenatal information. These women, even with limited usage of the MSEHR, demonstrated that they were eager to have access to and view their pregnancy information electronically.

This enthusiasm is reflected in other studies, suggesting women are in favour of using an EHR. Pregnant women are a group of patients that are information 'savvy',

along with patients in the child-health or disability group or those who want to monitor their diabetes, chronic disease and mental illness (86-90). This is reinforced in a recent review suggesting that Internet use and availability of medical information on the web have made patients more aware of symptoms, diagnostic tests and treatments. Although this review encompasses mainly doctor-oriented studies, it does highlight that there needs to consensus is required on what patients want in an electronic record and there is agreement that it should be easy to understand (89).

Content in the record

Although women did not view the MSEHR often, responses indicated that women wanted access to their previous results and visits. Women generally did not have issues with obtaining a log-in, which is supported in a recently published survey examining the MMH patient portal usage and perceptions from women (88).

Although this research encompasses responses from all women visiting the antenatal clinic at the MMH and not specifically those participating in GP shared-care, it does verify our findings. It also reassures us that women want to view their online record to prepare for a clinic visit or to reflect on what happened at a visit, as they did using the PHR (88).

Sharing the record

As women did not access the record reliably, they also did not share the MSEHR with family. However the literature does say that patients accessed their EHR while waiting to be seen by their health care provider (91). Having this access is a positive step toward sharing information with providers.

The women in our study did get a login to their MSEHR but did not receive education on how to use it and so had limited exposure to the record or did not view their information on an ongoing basis throughout their pregnancy. Conducting the interviews one year following the introduction of the MSEHR and at the 36 week visit has provided sufficient time to determine if the MSEHR was a useful maternity tool throughout the pregnancy. Given the opportunity to ongoing education around accessing and seeing the potential benefits of having an EHR, women in this study could have given more valuable insight into the benefits and challenges of being electronic. Furthermore the women in this study, even when probed about potential

security violations did not express concerns about security and confidentiality. These findings are in contrast to concerns cited in the literature (83-85). These privacy concerns have been cited as the main reason for the slow uptake in participation rates by consumers, which is surprising considering Australia is a nation happy to shop online and give out banking details (21, 89, 92). The National PCEHR and the MSEHR have been promoted as being more secure than paper and as being a beneficial tool to improve communication by providing easy and ongoing access to consistently current data (93, 94).

7.4 Qualitative Findings – Interviews with health care providers

Findings were analysed from: 1. GPs, 2. Midwives, 3. Hospital doctors, 4. Allied health (physiotherapist, occupational therapist, social worker, psychologist and dietitian). The themes identified from providers using either the PHR or MSEHR were: 1. Selective use of records, 2. Communication of care, 3. Negativity using the records.

7.4.1 Providers using the PHR

Selective use of the records

When using the PHR, it was evident that GPs felt responsible for only parts of the information on the PHR and that a re-design to suit their specific sections would be welcomed. The PHR seemed to have lost its utility as a tool for integrating care between the hospital and the woman.

Communication of care

Additionally, health care providers also thought the PHR was important for transfer of pregnancy information, but consider there to be superfluous sections of the record that are not required. This issue has been raised previously and subsequently resulted in the re-design of the PHR to have segregated sections for the care provider and the woman. With the introduction of the EHR at the MMH, a modified PHR was also introduced to replace the version referred to in this study. The PHR is now in three separate sections for: 1) Health care provider clinical information, including obstetric history and clinic visit data and sections 2) and 3) For women to

have access to contact phone numbers, a glossary and to document birthing and breastfeeding preferences (see Supplementary file 2).

Negativity using the record

Although modifying the PHR delineated pertinent information, there is still confusion as sections are the same colour and become disorganised pieces of paper and difficult to navigate when looking for information. Although this PHR was designed with good intentions to make access to information easier, it continues to need refinement in design.

7.4.2 Providers using the MSEHR

Selective use of the record

As with women, this study indicates that health care providers appear to be in favour of using an EHR. Hospital health care providers and GPs could see the advantages of having access to information and connecting to other providers. Having an 'up to date' and even interactive e-record has benefits over a paper version that is seen as a retrospective repository of information (95).

Communication of care

This study did however identify issues of complexity intertwined in data entry and viewing of information in the MSEHR. Data in the MSEHR is entered in different screen views depending on the user and the location of the data entry. Hospital providers enter data through the Matrix database and view through a separate Verdi interface while GPs enter data through their own practice database. The woman views her MSEHR information through a patient portal and can enter text or notes to ask providers at her next visit. Interviews revealed that at no time did the health care providers view the EHR through the woman's patient portal view and so had no comprehension of what information she could access and view.

Negativity using the record

The interviews revealed inadequacies in the support needed to facilitate ongoing understanding and usage of the record for health care provider's perspective. As demonstrated in Appendix 9, the MMH developed a workflow diagram in the implementation phase, but as hospital providers were not familiar with this

document, further education would benefit a greater participation rate. The document could also be refined to focus on the GP shared-care model, again to alleviate any confusion of workflow practices. The study also went a step further to determine the usage of and sharing of information in the MSEHR, finding that GPs were having difficulty accessing the MSEHR or that it was time consuming. Consequently, GPs were not sure if the MSEHR was operating at all. Even after the introduction of the MSEHR, those opting to go 'electronic' were given a modified version of the PHR. This parallel of documentation is not uncommon and reiterated in many health care settings (96, 97).

Concerns such as this have also been reported at the national level with interest in the PCEHR appearing to have subsided (98). Additionally and similar to the national PCEHR, the MSEHR was originally planned to incorporate referral and discharge summary functionality (24, 99), but this capability has not yet been included. GPs expressed the desire for these programs to be included in any future update of the MSEHR. Interestingly, providers in this study did not consider e-health security to be an issue or concern, despite this being raised in the literature (89, 92, 100).

7.5 The contribution of postpositivism to the study outcomes

The postpositivism paradigm has afforded the opportunity to bringing together quantitative and qualitative studies in a multimethod theory design. This paradigm has provided a framework on which to apply the context of the information to a process. Using multimethod quantitative and qualitative methods has been integral to fit with the positivist values of traditional scientists and the real world action approach of the postpositivist movement (101). Referring to papers using the postpositivist paradigm on similar topics has assisted to guide the study design. This research, "The use of an EHR in a maternity shared-care environment" is a topic of great interest in the present health reform agenda in Australia. The combination of two equally important methods has been an ideal way to present study findings to the process driven, even bureaucratic arena of health policy makers. Having a rigorous, concrete quantitative approach together with an exploratory, social qualitative approach provides a forum onto which research findings can be translated into practice.

7.6 Triangulation between women and health care providers

Interpreting the findings from both women and health care providers has afforded an opportunity to gain an insight into meaningful experiences using a PHR and an EHR. Health care providers have utilised some version of a PHR in maternity care for 20 years. Subsequently providers are very familiar with using the record and the role it plays in integrating care between themselves and women. As the record has evolved, so has the intention of the record moved to make the woman the focus of care. Both the women and health care providers considered the PHR a useful tool to use. The differences in findings between the groups were that women did not think the PHR had been designed to integrate care around them. The true intention of the PHR has been 'lost in the translation'. The PHR has grown to be a comprehensive document, with sections for GPs, women and hospital providers. However women did not feel engaged with the record and providers saw the sections relevant to them. Even though providers individually cared for the woman as a whole, they did not utilise the PHR effectively to integrate the information.

Both women and health care providers were enthusiastic about using the MSEHR. All of the groups could see a future in an EHR in maternity care. All of the groups were not aware of how the MSEHR worked as a health summary to be viewed by all and subsequently had limited exposure to using the record. All groups talked about lack of knowledge.

7.7 Comparisons with the literature

The key points taken away from the literature review were: 1. There were no papers addressing data completeness in a maternity shared-care environment, 2. The PHR was well regarded in maternity setting and used routinely by women and hospital midwives and doctors, 3. There were positive impressions of using an EHR to share information between providers, but very little knowledge about an EHR from a GP perspective.

This thesis has: 1. Presented a publication to fill a gap reporting on data completeness in maternity shared-care, 2. Conferred with findings that the PHR is a highly regarded document, but with new findings of shortfalls in design and how it is

used, 3. Also found that there were positive motives for using an EHR from both women and health care providers, which have not yet been realised and added to a gap on knowledge about the use of the record by GPs.

7.8 Significance of the study

The significance of this study is that it the first to compare both: completeness of data collected and experiences of women, hospital care providers and GPs using the PHR and EHR in a maternity shared-care environment. The study is the first to elicit rich, meaningful in-depth data about the challenges faced and also the positive aspects to using the records by means of face to face interviews and focus groups. While this study demonstrated that the PHR has wide approval from women and health care providers, the EHR is considered to be favoured and the 'way of the future' in health care (6, 88, 91, 102). The EHR provides the ideal platform on which to accurately and succinctly capture the recommended maternity variables that can then be available to all users of the record. The issues identified in using the PHR to its full potential and the barriers identified in using the MSEHR, has provided an opportunity to inform hospital administrators, managers and software developers about strategies to improve the integration of maternity information. Additionally, improved shared viewing of information from a woman's perspective would promote them to be empowered and foster improved interest and awareness of care processes in their pregnancy. The study has utilised a multimethod design to unite the equally important quantitative approach of examining data completeness with the qualitative approach of seeking and exploring interviews from women and health care providers for experiences of using the PHR and MSEHR.

7.9 How do findings relate to national maternity and EHR strategies

Our study has identified with the National Maternity Services Plan to provide "woman-centred care within a safe and sustainable system". The plan emulates a vision to give women access to high quality , evidenced-based maternity care in a location close to where they live (103)p 3). In order to do this, the plan outlines priorities such as increasing access to information and facilitating a culture of interdisciplinary collaboration in maternity care. Our study did support the use of the

PHR as an integral part of maternity care, particularly in the GP shared-care model where the record has provided the only link between hospital information for the woman. However this study also demonstrated that the PHR has deficiencies in completeness of data with some best practice variables being recorded in an ad-hoc way in free text areas. Additionally, GPs and hospital providers did not utilise the PHR in its entirety, instead just recording the information they think is necessary for them. Understanding of and encouraging reviewing all sections of the PHR with the woman would ensure that pregnancy issues would not get missed and a continuity of care was realised. The national maternity services plan advocates to build on the current PHR as a tool for continuity of care and also to utilise relevant clinical practice guidelines to ensure safety and quality initiatives are implemented (103). Redesigning the PHR to include best practice fields and also promote ease of use as recommended in this study would facilitate a collaborative approach from providers and improve communication.

As a priority from the Australian Department of Health and Aging Commonwealth, a large investment of money has been spent in health information to implement a national PCEHR with promises of benefits to improved linking of information, quality and availability and of data. These benefits were anticipated to relate to efficiency, safety and give patients access to their information to promote participation in their care (90, 91, 99, 104, 105). These priorities were supported in Australia's First National PHC Strategy "Towards a 21st Century Primary Health Care System" to provide information and technology including e-health (electronic health records and use of new technologies integrating care and improving patient outcomes) (25).

The MSEHR as a local EHR was introduced to connect women, GPs and hospital providers. Our study found that women and providers were enthusiastic about using the MSEHR but found lack of knowledge, understanding and education around how to use the system and additional IT access issues as major barriers to adoption of the record. These results from our study are not dissimilar to those found in the implementation of the PCEHR and EHRs internationally in terms of low awareness and need for organisational support (106-108). Additionally and similar to our study, providers have not been receiving ongoing education and still do not have the IT

capabilities required to operate the PCEHR (109). A review of the PCEHR key concerns disseminated in 2013, noted that usability of the system should be a priority, change management to foster support, promote education and training modules. Furthermore improved log-in processes such as a single sign on and ease of navigation between health applications have been highlighted in both the MSEHR and PCEHR systems (110). Similarly having an EHR with a value proposition of having datasets populated with clinically usable information is significant to providing good quality and safe care (110). Encouragingly, the MSEHR demonstrated a more complete set of evidenced based variables than the PHR, which is a positive step in providing safe care.

Additionally addressing these issues as recommended in the review will promote integration of care which is currently lacking. There is a need and almost an urgency to utilise the potential for patients and providers being effectively linked in their care provision. We live in a world surrounded by technology, yet functional e-connectivity has eluded the health sector. Despite more than ten years of preparation and with international models available on which to gain experience, Australia is yet to deliver and support a working EHR. The flurry of activity which occurred when development of the PCEHR was in full swing, has now petered to small servings of e-health progress (111). However having these issues being identified in the review have provided initiatives to move ahead and progress the PCEHR. Australia has chosen an 'opt-in' model for adoption, but consensus suggests that because providers are not sure exactly what the PCEHR is, there are high 'non-adoption' rates. A move to the 'opt out' has been suggested as a solution to low adoption rates. Furthermore in order to move ahead with e-health adoption, identifying what patients or consumers want and what health care providers need to support their existing workplace practice and clinical transactions is paramount (97).

Additionally there are ongoing resistance issues of incentive payments, extra time it takes to register and educate patients. Furthermore with a focus on providing integrated health through the changing face of primary health care provision in Australia from Medicare Locals to Primary Health Networks, a charter of improved data storage, better access to and decision making support is integral to the success of a national EHR system. Additionally the implementation of EHR's in regional areas

of Australia would be a positive step in the provision of improved health care to these populations.

Providing a reliable, secure, trustworthy system to facilitate effective care between providers with the patient controlling the information is an ideal (110). Findings from our MSEHR study have reflected the issues identified in the PCEHR review. From previous editorial comments of nobody really knowing what is happening, what the plan is or what to do with the PCEHR, this review has provided an opportunity to move ahead (112). Initiatives such as telehealth and secure messaging have been successful additions to our e-health environment.

However, foremost to the successful implementation of any EHR is to have a clear agenda and a governing framework in which to operate. With such a complex environment as health care and the many people involved in development and implementation, it is imperative that our nation needs a clear vision of what we want from an EHR. As recommended in the review are considerations to improve our current governance arrangements (110, 113).

Chapter 8

Future directions and conclusions

8.1 Future directions

Studying the issues associated with the introduction of a new maternity EHR has provided the opportunity to explore the full potential of the record.

8.1.1 Consistency in data entry fields

The data entry fields in the EHR need to be continually monitored to follow any updates in pregnancy guidelines and have the capability to be modified to better capture the recommended best practice variables. These fields need to be consistent across different systems to enable a quality-standardised dataset to be reliably available and remain in accordance with national and local guidelines.

Following a set of prescribed medical terminology such as the Systematic Nomenclature of Medicine Clinical Terms (SNOMED) would assist in ensuring best practice (72). Health care providers require continued education and support for using the EHR in terms of understanding the value of best practice data entry requirements. Once providers are aware of the benefits of improved data availability and access, they are more likely to use the EHR.

8.1.2 Compatibility between systems in hospital

This study has highlighted the difficulties of using an EHR with many computer system components. The midwives and hospital doctors both spoke about not understanding exactly what the EHR was: was it the PCEHR (national record) and was it linked to the maternity database (Matrix) and/or the data viewing system (Verdi)? As discussed in the health care provider paper (Chapter 6), at the antenatal clinic prior to consultations with women, the providers were asked to log-in to Matrix and Verdi and toggle between the two systems. Many providers were not aware that these components together formed the EHR. This is seen as a tedious process and requires an entire system re-design. This is not a short-term solution and so in the interim, the solution is to provide training sessions to reduce confusion and equip providers with the knowledge and skills to quickly navigate between the systems. This is supported in the literature and will reduce time taken to enter and access information (71, 89, 114).

8.1.3 Compatibility with GP practice systems

The new or modified record systems need to be compatible with current or legacy systems and reliable for use in GP practices. It is recommended that further development of the EHR be undertaken to facilitate its use to the full capability intended by developers. Interoperability issues need to be addressed to promote an effective and usable EHR, and ultimately lead to a successful information system (89, 115). But the real advantage to having an operational EHR is being able to share information in order to provide the best clinical outcomes for health care receivers (21). Ensuring access to information through compatible systems is the gateway to having an improved and complete knowledge base.

8.1.4 Making discharge summaries a priority

Incorporating discharge summaries into the functionality EHR would enhance the usability and acceptance of the record by GPs. This need for this functionality is not unique to the MMH. Updates from the progress of the PCEHR implementation show that having working discharge summaries is a priority. Recent reviews have shown signs of improvement in producing discharge summaries in the national record. In August 2014 there was an increase of 6500 summaries, to add to a total of 57,106 since 2012 (116). Optimally, this will have a flow-on effect to improve discharge summary production in the MSEHR.

8.1.5 Collaboration with women

An additional aspect of the study demonstrated that while the data were extracted based on relevance according to guidelines, there was no consultation with women to gain a perspective on the requirements they would like to see in a maternity EHR. Further research into preferred personal access by pregnant women would give more insight into what information is important in a GP shared-care setting.

8.1.6 Ongoing education and support

Users of the MSEHR revealed that despite being aware of the MSEHR, they had not actually used it or had limited use of the record. Providers require training in the functionality of each of the computer systems (Matrix, Verdi) that contribute to the MSEHR health summary sheet, enhancing the general knowledge of all staff involved in GP shared-care (see Appendix 10). Women need to have instruction on how to access and interact with their view of the MSEHR, which is shown in Figure 8.1.

Welcome to

Mater Patient Portal

What is Mater Patient Portal?

Mater Patient Portal is a secure online service hosted by Mater Health Services that provides you with a personal gateway to Mater health information.

Through Mater Patient Portal you will be able to complete your Mater registration or preadmission form online and access Mater Hospital information brochures and approved external links.

For expectant mothers, creating a Mater Patient Portal account is required to access a Mater Shared Electronic Health Record (EHR), an electronic alternative to the paper Pregnancy Health Record.



Who can register for a Mater Patient Portal account?

Anyone can create a new patient portal account.

Who can apply for access to their Mater Shared EHR?

At this stage only pregnant women will be able to apply for access to their Mater Shared EHR. More information can be found under the Health Record tab once you have created a Patient Portal account.

If you have any questions please contact the Mater Patient Portal team on 1800 228 470.



What can I do on the site?

- Complete your admission forms
- Record and submit your birth plan
- View your pregnancy information
- View your appointments and attendances
- Access Health information
- and much more

[Register now](#)

[Already registered? Log in here](#)

[About Mater Mothers' Private Brisbane](#)

[About Mater Mothers' Hospital](#)

Figure 8.1 Patient portal view with link to access the MSEHR

To facilitate improved usage by women, hospital providers need to be aware of the MSEHR recruitment process and discuss use of the record at antenatal visits. Subsequently, women need to be educated about the functionality and capability of the MSEHR while at the hospital and GP clinic visits. Ensuring the patient portal is functioning and simple to use will improve uptake as would translating the e-health technology to a mobile app. Providing education is supported as an important step in promoting the MSEHR and follows on from findings found from a publication by Forster in 2014. Although the study included all women in the shared-care model (ie. not exclusive to GP shared-care), findings demonstrated that 60% (6,518/10,892) created a patient portal account and 48% (3,104/6,518) went on to request access to their MSEHR. Of these there were 671 views of the MSEHR. Interestingly, most respondents indicated via an online survey that like the MSEHR and would look at it in subsequent pregnancies (117). Our study demonstrated that at 36 weeks, that although women were still keen to use the MSEHR, they were not engaged to so. Being aware of the available resources posted on the Mater internal website would greatly enhance the staff knowledge base and equip them to engage with women presenting in clinic as demonstrated when linking to the Mater information links. The Mater Patient Portal link is a guide for women outlining what facilities are available through the portal.

The link can be found at YouTube via

<https://www.youtube.com/watch?v=b9ZSkQMpUe0#t=43>.

The [Mater Patient Portal – Take a Tour](#) is a link also outlining facilities through the portal and is found through the Mater website

<https://patientportal.mater.org.au/Home/TakeATour>

8.1.7 Re-visiting workflow processes

The MMH developed detailed workflow diagrams and step-by-step instructions on how to manage a clinic visit according to whether the woman has a PHR or MSEHR. The full workflow steps seen in Appendix 9 explain the process involved when a woman presents for her antenatal visit. On initial glance the workflow looks demanding, but with ongoing education and training the steps involved would

become streamlined. The benefit of having workflow sheets and templates is reinforced in the literature as a motivator for participation (114). While the MSEHR workflow sheet pertains to all models of antenatal care, a separate workflow just for GP shared-care would reduce any confusion, as shown in Figure 8.2.

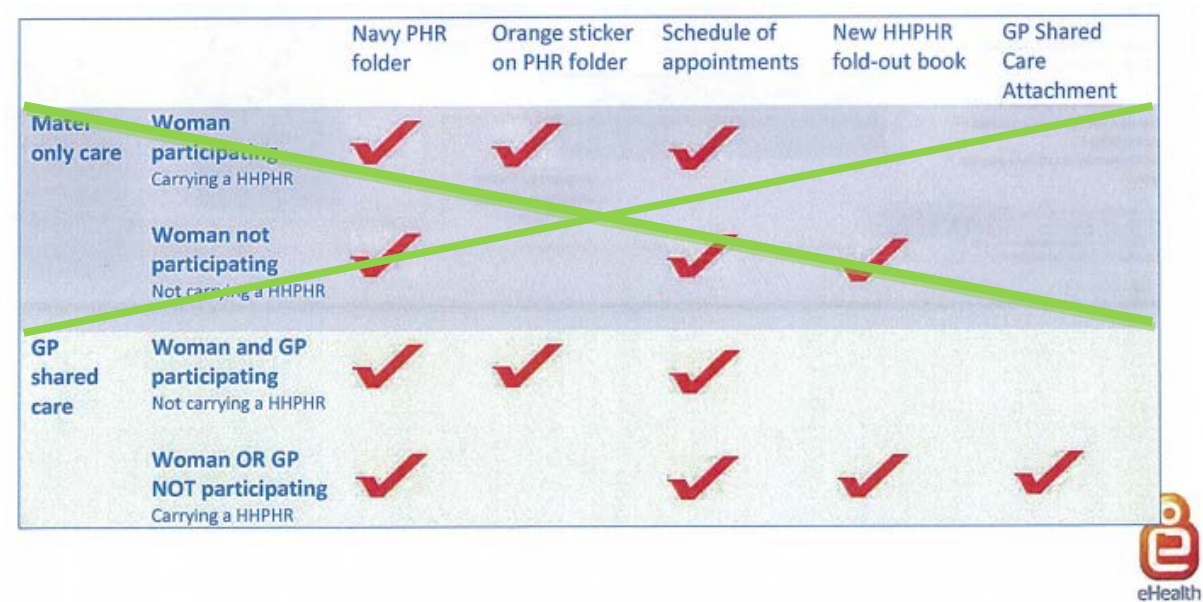


Figure 8.2 Workflow process for GP shared-care, with other models of care removed from sheet.

There is a step in the workflow to print the antenatal record from Verdi, even if the woman has opted to have an EHR, as shown in Figure 8.3.

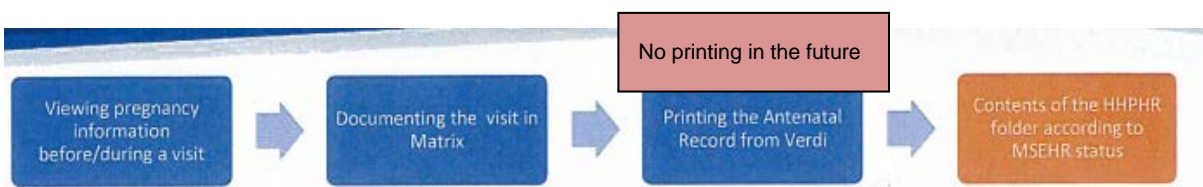


Figure 8.3 Suggested steps in documentation of care in EHR, removing the printing step.

Ideally, printing the antenatal record could be removed if the woman has an MSEHR. Presently, it is difficult to eliminate this step as not all GPs have access to the MSEHR and without paper would not have clinic antenatal notes available. An example of a paperless setting was realised when in 2014, the first truly integrated digital hospital opened in Australia. This initiative was an important milestone in the

national e-health reform agenda and a flagship hospital for the whole of Australia (118). Until the technologies of the newly operational, fully digital regional hospital are widespread in other centres, paper will continue alongside the MSEHR (119). Additionally, staff should be re-oriented to the MSEHR and be aware that if the woman has an orange sticker on her antenatal notes, she has access to her MSEHR. As an organisation, the MMH has committed to implementing the MSEHR. Consequently hospital health care providers are accountable for accurately managing women's maternity records whether they are in the form of the PHR or EHR. Monitoring how well the workflow process is adhered to become an issue of providing the best possible care to pregnant women. Including how well providers are managing maternity health records in the annual performance review is an opportunity to address any concerns or deficiencies occurring with the workflow process. The review also enables the organisation to promote an ongoing awareness of the importance of including the MSEHR in the everyday practice of maternity care.

8.1.8 Collaboration between national stakeholders, hospital administrators and health care providers

In order to move the MSEHR system forward, local and achievable changes can be implemented through collaboration with hospital managers and health care providers. To tackle the challenges of software compatibility and capability, collaboration with the original creators of the MSEHR program is required. These creators include NEHTA and business representatives, MMH Information Technology, Medicare Locals representatives, Indigenous and consumer advocates.

8.2 Jurisdiction complexities

The discussion has highlighted issues identified in the National Health Record, some of which are reflected in the MSEHR. A key concern included in the 'Review of the Personally Controlled Health Record' highlighted the inadequacies of the development or compliance with standards necessary for adoption of any process or system across jurisdictions of different states and territories' governments and legislations. Also mentioned in the report was the inadequacy of the Governance

Processes to represent industry or to effectively balance the needs of government and private sector organizations (120, p14). Successful implementation of the Personally Controlled Electronic Health Record (PCEHR) requires the integration of existing systems within public, private and community based-networks, both at National and State/Territory levels. In order to achieve this, a collaboration of government players, care providers and consumers are necessary to coordinate a united approach in developing a system suited for all.

While the National e-Health Transitory Authority (NEHTA) has been the organization responsible for the coordination, progression and adoption of eHealth in Australia (121) and funded jointly by the Federal and all State and Territory Governments (122), the organization is not equitably represented by the key stakeholders. The original governance structure and board of government representatives, is now outdated and a revision of this membership is occurring with the decision to replace NEHTA with the Australian Commission for eHealth from July 2016. The PCEHR will be transformed into the *myHealth Record* with a more user friendly system, to better reflect the needs of health professionals and the existing clinical workflows with in practices (123). This very complex implementation of an eHealth system across many jurisdictions and health service providers requires the experiences and voices of clinical experts and consumer reference groups to be considered. Selecting and combining appropriate and varied key representatives is necessary to identify the particular issues associated with different health and technology needs. A transparency of combined knowledge can promote attainment of working eHealth solutions. It is hoped the new Commission will accomplish this.

8.3 Conclusions

While the scope of the study is relatively small compared to many studies in the EHR setting, findings are consistent with larger national and international studies. The potential benefits of computer-based health records have been discussed in many health care settings, but the reality is that paper-based and electronic records are still being used in parallel. EHRs need to have the capability to provide complete and relevant data but also be developed to operate efficiently and effectively.

Understanding the nature of health care and uniting to provide a framework and guidelines through which to develop a functioning EHR will continue to be an important part of the design process. This study is not unique in its findings and has highlighted the challenges of lack of awareness and inoperability that patients and health care providers face when using an EHR. However, this study has demonstrated an improvement in data completeness in the EHR and the capability to collect best practice variables. With an ongoing commitment to supporting e-health, the MSEHR will ultimately be a component of the national PCEHR, adding obstetric and primary health care information to improve the integration of maternity care.

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Appendices

Appendix 1: Mater Mothers' Hospital Pregnancy Health Record Antenatal Checklist

(affix identification label here)
 UMR:
 Family name:
 Given name(s):
 Address:
 Medicare number:
 Date of birth:

Antenatal Care Checklist

Additional appointments may be required according to individual need. Please discuss any questions or concerns you have during your antenatal, labour or postnatal period with your care providers.

Visit	Activity	Notes
First Visit Preferably before 12 weeks	<input type="checkbox"/> Discuss/order/perform routine investigations and genetic counselling Bloods —group and antibodies, FBC, syphilis, hepatitis B&C, rubella, HIV and urine dipstick/MSU Antenatal screening —Nuchal Translucency + Bloods at week 11–13 rd <input type="checkbox"/> Diagnostic morphology 18–20 weeks <input type="checkbox"/> Offer pap smear if due <input type="checkbox"/> Discuss normal breast changes / examination <input type="checkbox"/> Send hospital referral. Note interest in birth centre care if applicable. <input type="checkbox"/> Discuss folate and iodine supplementation	
12–18 Week Midwife Booking in Visit	<input type="checkbox"/> Discuss preferred model of care <input type="checkbox"/> Commence smoking/alcohol cessation counselling <input type="checkbox"/> Complete SAFE Start or similar tool and EDS (EPDS) <input type="checkbox"/> Discuss recommended weight gain/nutrition <input type="checkbox"/> Discuss physiotherapy <input type="checkbox"/> Discuss reasons to breast feed <input type="checkbox"/> Offer antenatal classes: <input type="checkbox"/> Accepted <input type="checkbox"/> Declined	
20 Week Visit	<input type="checkbox"/> Obtain consent for Anti D prophylaxis <input type="checkbox"/> Confirm expected date of birth <input type="checkbox"/> Confirm model of care <input type="checkbox"/> Review blood/scan results <input type="checkbox"/> Discuss skin to skin contact <input type="checkbox"/> Discuss initiation of breast feeding/baby led feeding <input type="checkbox"/> Discuss positioning and attachment of baby	
Subsequent Visits A minimum of every 4 weeks until 28 weeks	<input type="checkbox"/> Discuss benefits of rooming-in (baby/mother staying together) <input type="checkbox"/> Discuss exercise and rest <input type="checkbox"/> Week 26–28: Obtain GCT/FBC/antibodies (GTT when indicated) <input type="checkbox"/> Review blood results <input type="checkbox"/> Week 28: Provide first dose Anti D if applicable <input type="checkbox"/> Discuss home safety and hazard identification for injury prevention	
30–32 Week Visit with Midwife	<input type="checkbox"/> Discuss birth preferences <input type="checkbox"/> Discuss discharge planning including post-natal supports <input type="checkbox"/> Discuss exclusive breast feeding for six months	
34 Week Visit	<input type="checkbox"/> Week 34: Provide second dose Anti D if applicable <input type="checkbox"/> Discuss expressing breast milk and safe storage <input type="checkbox"/> Review EDS (EPDS)	
36 Week Visit Then as clinically indicated every 1–2 weeks until 41 weeks	<input type="checkbox"/> Discuss signs of early labour, when to come to hospital <input type="checkbox"/> Book elective caesarean section (if applicable) <input type="checkbox"/> Review blood results <input type="checkbox"/> Review breastfeeding information	
41 Week Hospital Visit	<input type="checkbox"/> Discuss induction of labour for week 40 +10–14 days plus or minus membrane sweep <input type="checkbox"/> Monitoring if indicated as per current fetal surveillance guidelines	


Medical Information

DO NOT WRITE IN THIS BINDING MARGIN

Page 9 of 20


Extract from the Mater Mothers' Hospital Pregnancy Health Record, Version 2, 12/2010

Appendix 2: MSEHR Home Page



[Home](#)
[Health Record](#)
[Health Information](#)
[Contact Us](#)
[Messages 2](#)


Welcome





Mater Testmother
 DOB 08-Dec-1971 ▼


[Personal Information](#)
[Appointments](#)
[Pregnancy ▼](#)
[My Pregnancy](#)
[Prior Pregnancies](#)
[Personal Control ▼](#)
[User access](#)
[Block Health Care Providers](#)
[Audit Trail](#)


Information recorded about my pregnancy



My Antenatal History
 History recorded early in my pregnancy.


My Antenatal Visits
 Summaries of my visits to clinicians for antenatal care.



Issues and Plans
 Identified medical and obstetric issues and management plans.



My Test Results
 Results of my laboratory and ultrasound tests.


My Healthcare Providers
 Details about the providers of my antenatal care.


My Reports
 Pregnancy reports to view and print.

Details that I record


My Notes/Questions
 To record my notes and questions for providers.


My Birth Preferences
 My preferences for birth and postnatal care.

[only](#)
[Fetal Movements](#)
[Labour and birth - what to bring to hospital.](#)
[Rhesus Factor](#)
[Anaemia](#)
[Wellbeing in pregnancy: coping and stress management](#)
[Exercising in Pregnancy](#)
[Labour and birth - information for women and families](#)
[Breastfeeding and your new baby](#)
[Healthy eating during pregnancy](#)
[Child safety restraints](#)
[Correct use of seatbelts](#)

Appendix 3: Ethics approval documents

3.1 Full Human Research Ethics Approval document



MATER HEALTH SERVICES HUMAN RESEARCH ETHICS COMMITTEE

27th June 2012

Ms Glenda Hawley
Centre of Research Excellence
School of Medicine
Discipline of General Practice
Level 8
Building 16/910
Royal Brisbane Hospital
Herston 4006

Dear Ms Hawley

Re: Protocol Ref No. 1902M "Investigating adherence to maternity best practice: what do we know about the experiences using a paper versus electronic record"

I write to advise that the Mater Health Services Human Research Ethics Committee considers the above study to meet the requirements of the *National Statement on Ethical Conduct in Human Research* (2007) and has granted ethical approval for your research proposal. Please accept our very best wishes for the success of this study. *In all future correspondence with the Committee please quote the Mater reference number.*

Documents reviewed and approved include:

- Cover letter dated 1st June 2012
- Principal Investigator CV – Ms Glenda Hawley
- Supervisor CV – Professor Claire Jackson
- Supervisor CV – Dr Tina Janamian
- Supervisor CV – Dr Shelley Wilkinson
- NEAF
- Research Question dated 5th March 2012
- Research Protocol Amendment 30th May 2012
- Woman Information Sheet dated 29th May 2012
- Hospital Clinician Information Sheets dated 29th May 2012
- Community Clinician Information Sheets dated 29th May 2012
- GP Letter dated 5th March 2012
- Woman Consent Form dated 29th May 2012
- Hospital Clinician Consent Form dated 29th May 2012
- Community Clinician Consent Form dated 29th May 2012

Mater Misericordiae Health Services Brisbane Limited
ACN 096 708 922

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South Brisbane,
Queensland 4101 Australia
Phone + 61 7 3163 8111
www.mater.org.au

10621
11/07



3.2 Low risk approval document



MATER HEALTH SERVICES HUMAN RESEARCH ETHICS COMMITTEE

18th August 2011

Dr Shelley Wilkinson
Senior Research Dietitian
Mater Mothers' Hospital & School of Public Health (Griffith)
L3 Mater Childrens Hospital, Stanley St
South Brisbane, QLD 4101

Dear Dr Wilkinson

Re: Protocol Ref No. 1780QA The quality, governance, and sustainability of a share-care maternity record delivered within an e-health framework between the Mater Health Services and Participating General Practices, South Brisbane

I write to advise that the Mater Health Services Human Research Ethics Committee has reviewed this research project and recognises that the project meets the requirement for Low and Negligible Risk Research as set out in the National Statement (Section 5.1.18 – 5.1.21) and has granted ethical approval for your research project. Please accept our very best wishes for the success of this research project. *In all future correspondence with the Research Ethics and Governance Office please quote the Mater reference number.*

Please note the following conditions of approval.

- The Principal Investigator has responsibility for ensuring that the project is conducted in accordance with the National Statement, with relevant legislation and with Mater Health Services and responsibility for monitoring compliance rests with your Head of Department.
- Any departure from the protocol detailed in your proposal must be reported immediately to the Human Research Ethics Committee.
- When you propose a change to an approved protocol, which you consider to be minor, you are required to submit a written request for approval to the Chairperson, through the Research Ethics and Governance Office. Such requests will be considered on a case by case basis and interim approval may be granted subject to ratification at the next meeting of the Human Research Ethics Committee.
- Where substantial changes to any approved protocol are proposed, you are required to submit a full, new proposal for consideration by the Human Research Ethics Committee.
- You are required to advise the Research Ethics Coordinator immediately of any complaints made, or expressions of concern raised, in relation to the study, or if any serious or unexpected adverse events occur.
- To access medical records, for the purpose of this study, please provide a copy of this approval letter to the Health Information Services and Privacy Office (if applicable).
- The Research Ethics and Governance Office may choose to conduct an interim audit of your research project.

You are reminded that this letter constitutes ethical approval only. You must not commence this research project until authorisation from the Research Governance Office has been obtained.

Yours sincerely

A/Prof Andrew Crowden
Chairperson
Mater Health Services Human Research Ethics Committee

Mater Misericordiae Health Services Brisbane Limited
Research Ethics Coordinator, Room 51-53, Level 5, Queensland Building & Construction Authority
ACN 096 708 922

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Queensland 4101 Australia
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Appendix 4. Search Strategy

Medline OVID

Maternity

Keywords: (matern* or prenatal* or perinat* or antenat* or midwi* or obstetric).ab,ti.


MeSH: Obstetrics/ or Pregnancy/ or Hospitals, Maternity/ or Prenatal Care/

Record

Keywords: (record* or chart* or note* or card*).ab,ti.

MeSH: medical records/ or health records, personal/ or medical record linkage/ or medical records systems, computerized/ or electronic health records/

Keywords and MeSH subject headings. Search was too big. Narrowed down in the next screen by using focused MeSH for the medical records terms. We also removed the truncation for the words perinat*, card*, chart*, note*.

 Wolters Kluwer Health

OvidSP

[My Account](#) | [Support & Training](#) | [Help](#) | [Logoff](#)

Search Journals Books My Workspace EBP Tools

▼ Search History (7 searches) (Click to close)

View Saved

<input type="checkbox"/>	# ▲	Searches	Results	Search Type	Actions
<input type="checkbox"/>	1	(matern* or prenatal* or perinat* or antenat* or midwi* or obstetric).ab,ti.	283044	Advanced	Display More >
<input type="checkbox"/>	2	Obstetrics/ or Pregnancy/ or Hospitals, Maternity/ or Prenatal Care/	679032	Advanced	Display More >
<input type="checkbox"/>	3	1 or 2	782698	Advanced	Display More >
<input type="checkbox"/>	4	medical records/ or health records, personal/ or medical record linkage/ or medical records systems, computerized/ or electronic health records/	56641	Advanced	Display More >
<input type="checkbox"/>	5	(record* or chart* or note* or card*).ab,ti.	1591026	Advanced	Display More >
<input type="checkbox"/>	6	4 or 5	1621664	Advanced	Display More >
<input type="checkbox"/>	7	3 and 6	66991	Advanced	Display More >

Remove Selected

Save Selected

Combine selections with:

And

Or

[RSS](#)

Save Search History

CONTRACT

The next screen snapshot shows a search that was still too large. To further narrow search we used the adjacency operator (adj3), with key words only.

Search
Journals
Books
My Workspace
EBP Tools

▼ Search History (8 searches) (Click to close)
View Saved

<input type="checkbox"/>	# ▲	Searches	Results	Search Type	Actions
<input type="checkbox"/>	1	Obstetrics/ or Pregnancy/ or Hospitals, Maternity/ or Prenatal Care/	679032	Advanced	Display More >
<input type="checkbox"/>	2	(matern* or prenatal* or perinatal or antenat* or midwi* or obstetric).ab,ti.	281066	Advanced	Display More >
<input type="checkbox"/>	3	*medical records/ or *health records, personal/ or *medical record linkage/ or *medical records systems, computerized/ or *electronic health records/	31741	Advanced	Display More >
<input type="checkbox"/>	4	(record or records or chart or charts or note or notes or card or cards).ab,ti.	313375	Advanced	Display More >
<input type="checkbox"/>	5	1 or 2	781388	Advanced	Display More >
<input type="checkbox"/>	6	3 or 4	329751	Advanced	Display More >
<input type="checkbox"/>	7	5 and 6	19629	Advanced	Display More >
<input type="checkbox"/>	8	((matern* or prenatal* or perinatal or antenat* or midwi* or obstetric) adj3 (record or records or chart or charts or note or notes or card or cards)).ab,ti.	1696	Advanced	Display More >

Remove Selected
Save Selected
Combine selections with:
And
Or
RSS
Save Search History

Search
Journals
Books
My Workspace
EBP Tools

▼ Search History (11 searches) (Click to close)
View Saved

<input type="checkbox"/>	# ▲	Searches	Results	Search Type	Actions
<input type="checkbox"/>	1	Obstetrics/ or Pregnancy/ or Hospitals, Maternity/ or Prenatal Care/	679032	Advanced	Display More >
<input type="checkbox"/>	2	(matern* or prenatal* or perinatal or antenat* or midwi* or obstetric).ab,ti.	281066	Advanced	Display More >
<input type="checkbox"/>	3	*medical records/ or *health records, personal/ or *medical record linkage/ or *medical records systems, computerized/ or *electronic health records/	31741	Advanced	Display More >
<input type="checkbox"/>	4	(record or records or chart or charts or note or notes or card or cards).ab,ti.	313375	Advanced	Display More >
<input type="checkbox"/>	5	1 or 2	781388	Advanced	Display More >
<input type="checkbox"/>	6	3 or 4	329751	Advanced	Display More >
<input type="checkbox"/>	7	5 and 6	19629	Advanced	Display More >
<input type="checkbox"/>	8	((matern* or prenatal* or perinatal or antenat* or midwi* or obstetric) adj3 (record or records or chart or charts or note or notes or card or cards)).ab,ti.	1696	Advanced	Display More >
<input type="checkbox"/>	9	(record or records or chart or charts or note or notes or card or cards).ti.	59369	Advanced	Display More >
<input type="checkbox"/>	10	(matern* or prenatal* or perinatal or antenat* or midwi* or obstetric).ti.	117573	Advanced	Display More >
<input type="checkbox"/>	11	9 and 10	411	Advanced	Display More >

Remove Selected
Save Selected
Combine selections with:
And
Or
RSS
Save Search History

CINAHL

AB (matern* OR pregnan* OR antenat* OR prenatal* OR wom* OR midwi*) N3 (record OR note* OR chart OR card OR records)

= 1144

TI (matern* OR pregnan* OR antenat* OR prenatal* OR perinat* OR midwi* OR wom*) N4 (record OR note* OR chart OR card OR records)

= 183

4 = (MM "Maternal Attitudes") OR (MM "Maternal Health Services") OR (MM "perinat*")

5 = (MM "Pregnancy")

6 = (MM "Midwife Attitudes") OR (MM "Midwifery Service") OR (MM "Midwives")

7 = S4 OR S5 OR S6

8 = (MM "Computerized Patient Record") OR (MM "Medical Records") OR (MM "Patient Access to Records") OR (MM "Medical Records, Personal") OR (MM "Patient Record Systems")

9 = S7 OR S8

= 28

Embase Search

#1.3 OR #1.4 = 1708

#1.4

#1.1 AND #1.2 = 136

#1.3 = 1594

(matern* OR pregnan* OR antenat* OR prenatal*) NEAR/3 (record OR records OR notes OR chart)
AND [embase]/lim

#1.2

'electronic medical record'/mj OR 'medical record'/mj

#1.1

'maternal care'/mj OR 'maternity ward'/mj OR 'pregnant woman'/mj OR 'pregnancy'/mj OR 'prenatal care'/mj OR 'prenatal period'/mj

= 1708

Appendix 5. Summary of findings table for systematic review.

Does the article explicitly use the term completeness or some components of it?

Only antenatal variables described as evidence based or obstetrically important are included.

Question 1.

1. Does the use of a paper record improve the completeness of recorded key evidence based antenatal clinical data?

None of these papers were included in analysis but used as reference.

	Study	Key Findings - Q1a (using paper record)
1	Cleary 1994	<ul style="list-style-type: none"> - Generally high level of agreement between paper notes and St Mary's Maternity Information Systems (implemented in 3 maternity unit sites) - Of the 17 data items examined (delivery date/first visit/parity/delivery place/intended place/gestation/onset method/status conducting/mode of delivery/sex of infant/live-stillborn/ birthweight /state of peri/PPH/maternal infection), - states that variables are obstetrically important but not evidence based - Percentage agreement between paper notes and St Mary's Information System (electronic) - high level of agreement with 11 fields showing 95% agreement or better across sites and all but 2 fields exceeded 80% agreement <p>NOT Shared-care</p>
2	Peoples - Sheps	<p>Records of 969 respondents (physicians who used a paper prenatal record) were examined for presence or absence of 53 data items that corresponded to a defined dataset.</p> <ul style="list-style-type: none"> - Items of traditional obstetric significance, such as date of last menstrual period, previous pregnancy history, were present in >90% of all prenatal records - Weight at each visit found in 98%, syphilis test results in 96% of records - Important variable of USS performed (y/n), date of, indication only recorded in 39%, 26% and 10% respectively - Variables of more recent significance, such as chlamydia test results, cigarette smoking numbers, psychological assessment only present in <10% of all records - Alcohol use 51%, alcohol abuse 24%, drug abuse 44%, smoking (y/n) 59%, smoking number 25% <p>NOT Shared-care</p>
3	Singh 1994	<ul style="list-style-type: none"> - Examines completeness of data on paper Maternity record/journal - On antenatal history form (MHV 1) – incomplete (diabetes – 7/101, UTI – 18/101,

		<p>epilepsy – 0/101, high BP – 8/101, heart disease – 8/101, lung disease – 8/101, gynaecological – 21/101, surgery – 16/101, allergy 26/101, endocrine disease – 9/101, psychiatric disease – 8/101, sexually transmitted – 12/101)</p> <ul style="list-style-type: none"> - On record of antenatal visit form (MHV 2) – complete data is weight and height (at first visit) = 52/101 (51.5%) and 50/101 (49.5%) respectively <p>- also put in experiences EHR hosp</p> <p>NOT Shared-care</p>
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2. Does the use of an EHR improve the completeness of recorded key evidence based antenatal clinical data?

	Study	Key Findings - Q1b (using electronic record)
1	Cleary 1994	<ul style="list-style-type: none"> - To assess the validity of clinical information on a maternity electronic - Generally high level of agreement between paper notes and St Mary's Maternity Information Systems (implemented in 3 maternity unit sites) - Of the 17 data items examined - (delivery date/first visit/parity/delivery place/intended place/gestation/onset method/status conducting/mode of delivery/sex of infant/live-stillborn/ birthweight /state of peri/PPH/maternal infection) - states that variables are <i>obstetrically important but not evidence based</i> - Antenatal variables are 1st antenatal assessment / parity - In St Mary's electronic IT system – across all three maternity unit sites - all fields were completed with a high rate – complete in electronic records across maternity units with rates in excess of 99% - Variable with most difference between electronic systems was antenatal assessment date - in OB 1 site, variable recorded with 95% agreement – while the other OB sites (sites 1 and 2) , rates were 14% to 27% agreement between paper and electronic notes ---probably due to definitions of assessment date eg. by midwife or obstetrician <p><i>Generally there is a high level of accuracy in the electronic maternal data collection system.</i></p> <p>NOT Shared-care</p>
2	Chi 2011	<p><i>The Zambia Electronic Perinatal Record System (ZEPRS) was implemented to record demographic characteristics, past medical and obstetric history, prenatal care, and delivery and newborn care for pregnant women across 25 facilities in the Lusaka public health sector.</i></p> <ul style="list-style-type: none"> - to assess the utility of record - completeness

		<p>- Of the 116 675 deliveries recorded, 1123 (1.0%) had no record of antenatal care</p> <p>- Syphilis screening was documented in 95663 (83%) pregnancies</p> <p>-111108 (96%) women agreed to HIV testing.</p> <p><i>The results demonstrate the feasibility of using a comprehensive electronic medical to accurately ascertain completeness of data.</i></p> <p>NOT Shared-care</p>
3	Nielsen 2000	<p><i>The Standard Obstetric Record Charting system (STORC) was created – electronic</i></p> <p>Comparison Between Chart Review and STORC using ORYX (Joint Commission) Performance Measures</p> <p>History of diabetes - 0/18 (0%) in chart AND 1/276 (0.3%) in electronic STORC</p> <p>History of hypertension - 1/18 (5.6%) in chart AND 2/276 (0.7%) in electronic STORC</p> <p>NOT Shared-care</p>
4	Bernstein 2005	<p><i>Study comparing before and after implementation of an electronic prenatal record</i></p> <p>- Absence of prenatal USS result in pre electronic - 7(16%) compared with 0(0%) post electronic record (p<0.01).</p> <p><i>Also in question 3 section – using electronic ‘communication’</i></p> <p>NOT Shared-care</p>

<p>5. Cleary 1994</p>	<ul style="list-style-type: none"> - Generally high level of agreement between paper notes and St Mary's Maternity Information Systems (implemented in 3 maternity unit sites) - Of the 17 data items examined (delivery date/first visit/parity/delivery place/intended place/gestation/onset method/status conducting/mode of delivery/sex of infant/live-stillborn/ birthweight /state of peri/PPH/maternal infection) - states that variables are <i>obstetrically important but not evidence based</i> - In St Mary's IT system – across all hospital sites - all fields were completed with a high rate – rates exceeding 99% - only antenatal assessment data in one OB site, which was uncompleted in 7% of cases - Percentage agreement between IT system and notes - high level of agreement with 11 fields showing 95% agreement or better across sites and all but 2 fields exceeded 80% agreement - Field of antenatal assessment date showed only 14 to 27 agreement between notes and IT system in 2 sites – but probably due to inconsistencies in definition – <p>Little difference was found between the levels of agreement observed at the three sites – 5 of the 17 fields showed a range greater than 5% with only two fields exhibiting more than an eight-point range ?? –</p> <p><i>Recorded data on computer is largely accurate and consistent across 3 obstetric units.</i></p> <p><i>Database is a valuable resource. Model useful for other settings</i></p> <p><i>Generally there is a high level of accuracy in the electronic maternal data collection system.</i></p> <p><i>Data collected from case notes is an excellent basis for the validation of a clinical database, even considering the practical considerations of collecting data from paper, which may lead to errors.</i></p> <p><i>We suggest that eventually the use of computerised operational data collection may be the way forward for the collection of all audit data</i></p> <p>NOT Shared-care</p>
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Findings for Question 2. - PHR

2. Are experiences of women and health providers improved when using a paper record for experience, perceptions, satisfaction, access and usability?

	Study	Key Findings - Q2a (using paper record)
1	Elbourne 1987	<p><i>RCT - Compared women using usual co-op notes and women carrying new full case notes</i></p> <ul style="list-style-type: none"> - women carrying full notes were nearly 1.5 times more likely to say that they felt in control over antenatal care (RR 1.45; CI 95%: 1.08-1.95) and greater ease of talking with doctors (RR 1.75; CI 95%; 1.16-2.59) - these benefits seen despite women thinking that the full case notes were more difficult to understand and read - illegibility, rather than content difficulty - no differences in overall between the groups in terms of the women's feelings of being well informed, anxious, confident, depressed, satisfied with their care or about involvement of the father - women said that in the next pregnancy, they would use the same record they were presently using - already familiar - however tendency was greater in full case note group (RR 1.55; CI 95%; 1.43-1.81) - case note group was 58% and full case note group was 91% - no evidence that there would be more times in clinic that the record was not available - this happened equally whether the full notes were forgotten or not available from medical records - Fears of losing notes did not happen - increase in anxiousness carrying full notes did not happen <p><i>Results consistent with other studies. Very similar results to St Thomas study</i></p>
2	Lovell 1987	<p><i>RCT - Randomly allocated to carry own full notes or co-op card</i></p> <p>To test hypothesis that giving mothers their own notes would have a positive effect on satisfaction / sense of control / communication</p> <ul style="list-style-type: none"> - more women in full notes expressed satisfaction - felt well informed - felt comfortable talking with staff about birth and analgesia (1% in notes group were not informed c/w 12% in card group) - (difference was highly significant ($p < 0.01$)) - women in notes group - felt in control - 'my notes give me greater confidence'

		<ul style="list-style-type: none"> - mothers felt 'very well informed' about pregnancy, but 12% of the card group felt they had not been 'not at all well informed', compared to 1% in the notes group.= - difference highly significant ($p < 0.01$; chi sq. =7.6) - most women in notes group anticipated no difficulty communicating with medical staff and 75% said they were optimistic about how easy it would be to communicate with midwives -overall preferences had been taken into account - shared decision making - 51% in notes group and 40% in card group, but not statistically significant - involvement of babies fathers at delivery higher in notes group - notes group thought that their preferences were considered more (perhaps because they could talk to staff more. - in next pregnancy - notes group said they preferred notes (83%) and in card groups said 39% would prefer notes next time, despite not having used them - both notes and card group commented on bad handwriting - although not described , Lovell commented on design and format of notes requiring modifications if to be used as educational tool - perhaps to include area for patient input - no one in notes group lost record, but 25% in card group, reported that their hospital notes had gone missing - STAFF - 11 mothers did forget record - 10 were in card group and the only one from the notes group got her husband to fetch record immediately. This meant that record was available and staff did not have to wait for retrieval of missing notes <p><i>As a result of the trial, all women carry their own antenatal case notes</i></p>
3	Homer 1999	<p><i>RCT - 150 women randomised to either holding entire record (intervention) OR small abbreviated card (control)</i></p> <ul style="list-style-type: none"> - Multiparas who carried their own records were significantly more likely to report that the doctor and midwife explained everything in their records to them, than multiparas who did not carry their records or primiparas from either group ($p = 0.027$). There were no other significant differences - When asked in an open-ended question about their allocated method of record keeping, both groups of women were positive about their experience. - however those in entire record group were significantly more likely to feel in control - 89% - These women liked having access to their results and were able to follow their own

		<p>progress and felt more informed. Women felt that it gave them an opportunity to share information, particularly with their partner and other family members. This was especially important if the partner could not attend antenatal visits.</p> <ul style="list-style-type: none"> - The women who responded negatively from entire group, did so because (11%) gave reasons such as too bulky, system inconvenient and they were worried they would forget record. - Women from the card group felt the cooperation card was a convenient system, easy to carry and less bulky than the hospital record - Several women commented that 'they didn't know any different to be able to compare'. - The women who did not like carrying their cooperation card (11%) stated that they would have liked more information and would have been happier with their entire record. - Women in control group were more likely to feel anxious and less likely to have their records explained to them by health care providers. - Women in the intervention group, who had carried their own notes, were overwhelmingly in favour (89%) of doing so again in a future pregnancy cw 32 % prefer to use card again - 52% of card group said they would carry entire record next time, without having ever used it - women do not lose their records more often than the hospital, never forgotten notes 59% in entire record group cw 58% in card group nor are women who have unlimited access to their records more anxious with the additional information. <p><i>We conclude that women-held records are an effective method of record keeping in pregnancy. There are benefits for women and their partners, and women in Australian hospitals should be offered the choice of carrying their notes</i></p>
4	Brown 2011	<p><i>Cochrane - 3 trials - Elbourne / Lovell / Homer</i></p> <p>Loss of Notes - trials are discordant - Lovell states that carrying full notes prevents loss and Elbourne/Homer report no difference</p> <p>Satisfaction - all 3 trials reported that women felt more satisfied carrying full notes - 2 trials said that women felt more in control (Elbourne / Lovell)</p> <ul style="list-style-type: none"> - all trials reported that both full and card groups would prefer full notes in next pregnancy - all trials said that communication was improved carrying full notes -

5	Wilkinson 2007	<p><i>Trialling intervention of including a health behaviour screening tools directing smoking cessation, nutrition, and physical activity interventions that were combined with a PHR.</i></p> <ul style="list-style-type: none"> - The enhanced PHR represented an attempt to influence psychological, behavioural, and clinical outcomes within a more holistic model of pregnancy care. - From interviews - STAFF reported that enhanced PHR was time consuming and repetitive / increased workload - From focus groups - WOMEN not interested - shown to be non-feasible and no enhanced efficacy. Results from women gave preferred options for the design of a tool to accompany the PHR. - women preferred the content of the record to include information on pregnancy-related health, tests and referrals, and tools to track changes and progress in health and health behaviours. - women also expressed a need for ongoing monitoring of their pregnancy progress and tools for comparing progress against set standards. <p><i>Evaluation of a recent attempt to implement a woman-held PHR that integrated obstetric documentation and behaviour change strategies found that such an approach was not feasible. An alternative approach is required</i></p>
6	Webster 1996	<p><i>Study to determine satisfaction of women holding maternity record</i></p> <ul style="list-style-type: none"> - Demographics similar / knowing GP similar in both groups (women may need GP for reason other than pregnancy) - 53 (36%) of women in shared care forgot record at least once - satisfaction rated similarly / shared care group thought model was more convenient / less waiting time / over half said no disadvantages to shared care group - SCG group said it was more convenient (42%), more personal (27%), more information being provided (26%) - both groups mentioned fragmented care <p><i>Results are similar to Elbourne - high satisfaction - felt more in control</i></p>

7	Phipps 2001	<p><i>Reactions of women holding own maternity records cw standard care of records held at hospital</i></p> <ul style="list-style-type: none"> - Information very important to women - this is synonymous with other studies - perceived they were more in control of pregnancy - 80% more in charge of health - did show that women thought that having record with them was important as they often forgot what was said at the visit - important to possess all their information - size of record was important - big enough to be visible - full records encouraged them to talk to healthcare workers - felt on an equal level to health care providers - women thought that having full notes motivated them to read more about pregnancy - women thought that having full notes motivated them to read more about pregnancy, felt ownership, more responsible, increased confidence, - shared decision making, able to share with family and friends - no difference in results according to parity / fostered sharing of information with partners - 'tangible link' to pregnancy - 62% were concerned over losing record, although none did <p><i>Benefits outweigh any drawbacks of fear of losing or forgetting records</i></p>
8	Toohill 2006	<p><i>This paper explores the return rate of the pregnancy handheld record in a major tertiary</i></p> <ul style="list-style-type: none"> - 4 audits conducted over a 2 year period to determine rate of return. An increase in return of 6.6 % was noted - overall return rate of 85%. SPHR has potential for advantages but - also for disadvantages - When notes not available have no choice but to act on information from health facility. - and legally where do clinicians stand <p><i>Ongoing stakeholder assessments are imperative to assess the significance of the clinical risk management</i></p>
9	Kiran 2001	<p><i>Prospective study to find views of having access to case notes from women</i></p> <p>majority of women willing to carry record / women thought records were useful / felt more in control / only 12.5 % knew fully the reason to carry - ??health care providers did not explain</p>

		<p>the use of the record</p> <p><i>Hand held records are important aspects of record keeping</i></p>
10	Holmes 2005	<p><i>To trial and implement a client-held record system - (PMR) - Personal Maternity Record - staff focus group and women surveys 6 week postnatally</i></p> <ul style="list-style-type: none"> - WOMEN - most thought record was useful it was a good idea (57% extremely useful) / easy to use / doesn't improve documentation / never forgetting (82%) / suitable for all women. - record helped then to communicate with midwives and doctors (32% extremely useful) , - easy to use - understand documentation (13% not easy, 51% easy, 32% extremely easy) - satisfied with the way midwives and doctors explained PHR to them (38% satisfied, 46% extremely satisfied, 16% only moderately or not satisfied) - STAFF - most common response from midwives is that record is forgotten / doctors reported most common problem as not being able to retrieve info quickly, more staff training useful - also thought that it helped them talk to women (19% extremely useful, 42% useful, 35% moderate or not useful) - retrieving info 77% of midwives - women forgetting record at appointments, admissions, additional comments, document when does not present for visit - and 88% of doctors have had problems - most common problems are retrieving information quickly, not enough room for recording problems/admissions, no room for originality GP accessed record - 27% never asked, 16% occasionally, 51% every visit <p><i>Pilot demonstrated that client-held records are valued by women and appear to improve communication between women and staff. Back-up system is required when record is forgotten</i></p>
11	Draper 1986	<p><i>A study of women's views on carrying their medical records during their pregnancy was conducted in Cambridge in 1982. Eighty eight women who were given their full. Full notes compared with co-op cards</i></p> <ul style="list-style-type: none"> - 71 preferred full notes and 83 thought there were advantages in this policy. - a few women thought that there might be something on the record that they didn't want to

		<p>know about - mainly the baby</p> <ul style="list-style-type: none"> - this also worried practitioners but women also said that they didn't want anything kept confidential from them - Seventy seven women thought that there were advantages for women in reading their records; 20 found that which was written in their notes was difficult to understand or worrying (although a similar proportion of the control group also found the cooperation card difficult to understand); - 30 thought there were advantages for relatives and friends to be able to read the records; and 42 considered that carrying the records gave them a more responsible part to play in their pregnancy - Forty four women found difficulties in carrying the records around and 11 in remembering to take them to each visit. Only 12 (13%) women in the study carried their records with them whenever they left the house - too large for bag - In comparison half of the control group carried the cooperation card with them constantly. - Seven women, all of whom were either admitted to hospital or had complications during pregnancy, found particular advantages in carrying complete record <p><i>Most women found advantages in carrying the complete record, although it was too large to carry for practical purposes. Both groups experienced difficulty in understanding what was written on their cards.</i></p>
12	Shah 1993	<p><i>Pre-post intervention study – evaluation of centres in 8 countries who participated in a WHO collaborative study - changes in area where home-based maternal record (HBMR) was introduced compared with area with no HBMR</i></p> <p><i>The evaluation showed that use of the home based maternal record (HBMR) had a favourable impact on utilization of health care services and continuity of the health care of women while pregnant</i></p> <p>Perception – intended to improve continuity of care-</p> <p>Perception - Promotes referral / early recognition of 'at risk' pregnancies / practical record of care / focus on education</p> <p>Perception – provide visual information to the woman to remind her</p> <p>Perceived – woman - useful in determining specific needs</p>

		<p>Experience - Women did keep record in good condition – welcomed plastic cover</p> <p>Completion of information about pregnancy ranged from 100% in Zambia to 75% in Pakistan</p> <p>Experiences - In most centres where HBMR was used, a higher proportion of pregnant women attended the antenatal clinics</p> <p>Women using HBMR perceived getting better care</p> <p>Women said that it was a 'useful passport'</p> <p>Experience – written information generally good – in Philipines there was an 81% agreement of written information with a master log of information</p> <p>Experience – improved health education – about 40% of mother's in Egypt could recognise danger signs in pregnancy</p> <p>Experience – limitation was that Drs did not write on record as much as midwives - not as many action items or instructions for care - although in Philipines where staff were trained to use record - 92.4% of records had feedback information</p>
13	Mahommed 2000	<p>- Utilization of health services is variable but may contribute to the well being of women during pregnancy. If people understand when there is a risk of illness or death. they are likely to cooperate in reducing those risks and participate in their own care.</p> <p>In rural communities people need to be provided with simple but scientifically-sound technology adapted to their understanding and needs.</p> <p>One such technology is the homebased maternal record (HBMR). We assess the feasibility. understanding and usage of a locally adapted HBMR of the World Health Organization prototype in a rural community in Binga district. Zimbabwe.</p> <p>Retrieval cards were used –</p> <p>Of these 349 (49.1%) were retrieved of which none had to be discarded. Five had slight evidence of rodent damage. All others were in extremely good state indicating that mothers deemed</p> <p>reasons for low retrieval of cards (41%) include movement of mothers from the area, inability of the health workers to make contact after delivery, inability due to distance and unwillingness on the part of some mothers to return the cards.</p> <p>This is much higher than 17% reported in the WHO Collaborative study of eight participating countries".</p> <p>Contact with the health services was limited, particularly in the less accessible areas. It may also reflect poor communication by the research team on the need to retrieve the cards. This underlines the importance of the introduction of the card and teaching its use on the first visit.</p> <p>Unfortunately, although the collection of the cards 5 months after delivery had been timed to coincide with the baby's diphtheria, pertussis and tetanus./polio immunization, the</p>

		mothers usually only brought the child health card to these sessions.
14	Turner 2011	<p><i>Review of what is current state of a Patient Held maternal record in developing countries</i></p> <p>Women - increasing utility of patient held record was to improve education</p> <p>Words like confidence, control, better informed, satisfaction, interaction were repeated</p> <p>Loss of record not a significant issue</p> <p>Health care providers showed – developed country - improvement in communication, access and care – developing country - preventative measures of detecting risk and increasing educational opportunities</p> <p>Positive benefits in compliance with patients, generally willing to carry record although some did not use record at all</p> <p>37 studies show positive results of holding a patient held record, 24 neutral and 5 negative</p>
15	Patterson 2003	<p>- Aim of the study was to determine the effect of the woman held antenatal record card (PNC2) on the continuity of maternity care received when presenting to the acute rural setting for clinical assessment, in Rural NSW hospital</p> <p>Qualitative, open-ended questionnaires.</p> <p>Maternity consumers, 50 women who were inpatients receiving antenatal or postnatal care between August and October 1998. A stratified sample of healthcare professionals employed by the service, 12 midwives and 13 general practitioners.</p> <p>The self reported use of the antenatal card and the viewed effects of the card on the continuity of healthcare received.</p> <p>The study identified a significant difference between the responding professionals (93%) positive perception of the effect of the PNC2 on the women's pregnancy continuum of care and the maternity consumer (36%), who felt it bore little impact on their care. The study findings suggested a lack of compliance and standardisation in usage of the antenatal card negated any flow on effects for the women.</p> <p>The intended purposes of the PNC2 were compromised in this rural setting. The study recommends that stakeholders in rural maternity care be accountable for examining the benefits and barriers of their antenatal practices, that the rural community's expectations of 'continuity of maternity care' are sought and that there should be a review of the available models of rural antenatal care.</p>
16	Wood 1991	<p>A review</p> <p>Following a search of the UK literature since 1970 and discussions</p>

		<p>with other researchers, seven schemes were identified involving hospital and community staff working together in primary care settings - that is health centres, general practitioner surgeries or community clinics.</p> <p>The few initiatives to develop integrated community based antenatal care that have been reported in the literature in the last 15 years have evolved in response to a variety of local problems</p> <ul style="list-style-type: none"> -reduce delays in booking -improve uptake -reduce length of stay -reduce admissions
17	Thomas 1987	<p>The obstetric outcome and experience of care of 96 pregnant women attending an integrated community antenatal clinic staffed by general practitioners, a community midwife and an obstetric accredited senior registrar were compared with those of 100 women receiving traditional shared antenatal care. The views of the women and their practitioners were sought; obstetric data were obtained from obstetric notes, hospital records and cooperation cards.</p> <p>Fewer women attending the community clinic suffered from hypertension than women receiving shared care. The women attending the clinic reported that it had a friendly, relaxed and personal atmosphere. They also reported less inconvenience and a shorter waiting time for the obstetrician than women receiving shared care. They received greater continuity of care from the obstetrician but less from the general practitioners and community midwives than the control women. There was greater satisfaction with communication with staff among women attending the clinic, with the exception of the midwife whose role was not sufficiently well delineated. Practitioners in the integrated scheme appreciated the close working arrangements but experienced an increase in administrative tasks.</p>
18	Halloran 1992	<p>This paper was accepted for publication since it is a useful review of, the objectives of shared obstetric care from the point of view of the general practitioner.</p> <p>Shared obstetric care between hospital and general practitioner (GP) is being developed in several States in Australia as an alternative model of care for pregnant women in the public hospital system. The aim of this study was to determine the attitudes of participating GPs to the shared obstetric care programme at the Royal Women's Hospital, Melbourne. Fifty GPs were randomly selected, and face to face individual interviews were conducted using qualitative methods. GPs feel that the continuity of care they can provide during pregnancy and the postpartum is a very important and valuable aspect of their role as shared care providers. They are generally satisfied with the programme at the Royal Women's Hospital but some suggest that communication between the hospital and the GP should be improved. There was significant interest in being involved in deliveries in shared care programmes in the future and GPs question the appropriateness of the diploma of obstetrics as the only acceptable qualification for shared care.</p>

Findings for Question 2. - EHR

2. Are experiences of women and health providers improved when using an EHR for perceptions, access, satisfaction and usability?

	Study	Key Findings - Q2a (using electronic record)
19	Wackerle 2010	<p><i>Comparing maternity notes on a USB with control who didn't use USB</i></p> <ul style="list-style-type: none"> - Experience analysed - overall satisfaction with pregnancy and delivery / feeling of safety / interest / partner involvement - 98.5% wished to repeat USB experience / 7.5 of USB group shared stick with a doctor outside of the department / of controls 86.5% would have appreciated the experience / 18% of controls thought of occasions that USB would have helped / 80.5% felt safer of USB group / overall positive impression of stick. - few concerns over confidentiality (12%) - USB boosted women's confidence in their doctor (30%) - Access: 2/3 used USB regularly 1/4 after every consultation/ 32% never connected to computer and 11% did have access to a computer. USB did not need to be opened to experience reassurance <p><i>Study confirmed hypotheses that women would feel safer and in more control - more satisfied with a portable record</i></p>
20	Fawdry 2010	<p><i>Overview of maternity information technology in Britain, questioning usability, effectiveness and cost efficiency of the current models of implementation of electronic records</i></p> <ul style="list-style-type: none"> - summarises evolution of maternity projects - paper to PDA Australian pilot IT project to UK IT projects of MUMMIES data modelling (1988 - 1992), data dictionary (1998-2001) and National Maternity Services Dataset (2005-2007, 2009-current) - these projects have predicted a paperless future - but in reality paper will continue to be necessary to store information about pregnancy in different places - replacing paper with 'master copy' is undesirable and impractical

		<ul style="list-style-type: none"> - paper data will need to be transferred to a computer dataset - a universal maternity dataset is too complex to be created by small groups of clinical advisors convening intermittently, often can only access in places of USS, special care, delivery suites and maternity wards – <i>access</i> - has been expensive in design and implementation and also in midwife hours of entering data <p>Potential advantages - more reliable / faster transmission / reduction in medical errors / access anywhere / legible / better quality / offsite backup - <i>perception</i></p> <p><i>EEPD have potential to improve quality of electronic and paper records to improve international standards – <u>perception</u></i></p>
21	Curly 2012	<p>Response to Fawdry</p> <p>Many of the issues resonate with management of general hospital notes, while some are specific to maternity notes. Recent advances in management of records offer some glimmer of hope.</p> <p>Secondly, many believe that a slavish transition to fully electronic data will lose some of the narrative and richness inherent in the paper record. We have scanned 750,000 volumes of general hospital and 70,000 maternity records, and both are now available to view electronically. Although not structured, this allows colleagues to view records simultaneously across sites and to seamlessly view data from other specialties relevant to the care of the patient</p> <p>Fawdry et al. clearly speak with authority on the absence of standardization in maternity records. Standards for records in secondary care have been produced, but these are not widely implemented.⁴ In their absence, a more pragmatic approach to electronic patient records</p>
22	Homer 2010	<p><i>The trialling of a maternity electronic health record, using a 'Obi-MATE' - PDA (personal digital assistant)</i></p> <ul style="list-style-type: none"> - OBI-MATE was tested in 2 day workshop by staff - IT staff, midwives input / experiences / ideas / testing Obi-MATE - aesthetics / security / database fields (correctness) - used dummy information to test - feedback positive- recommendations / need foldout keyboard / option to add details in discussion fields / links to educational websites / obstetric calculator needed / need for more woman friendly terminology required / need to keep sensitive info confidential - could have inbuilt language translator

		<p>- limitations - cost not thought to be prohibitive, although initial rollout would be expensive / ability of staff to navigate OBI-MATE was a limitation / access for women at home was potential problem as in 2008 - 67% of households had home internet and 75 % has access to a computer</p> <p><i>Development of OB-MATE was positive experience with excellent interdepartmental collaboration. Workshop successful in identifying strengths and potential of OBI-MATE</i></p>
23	Winthereik 2008	<p><i>The paper seeks to examine how an online maternity record involving pregnant women worked as a means to create shared maternity care</i></p> <ul style="list-style-type: none"> - there are 2 boundaries to examine <ol style="list-style-type: none"> 1. between primary and secondary care provider and 2. between home and clinic - between primary and secondary - doctors refer to pregnant woman as patient, whereas midwives refer to pregnant woman as woman - envisaged that having an online maternity system would turn women into an 'active participant', rather than just receiving care – <i>perception</i> <p>Thus, the online record enacted her as a participant in the care process, and as an almost-colleague, who, besides other ways of relating to her pregnancy, would also, and perhaps primarily, relate to it as a medical case. The vision was to overcome the boundary between home and clinic by distributing responsibilities differently. What happened as the system was taken into use was that pregnant women enacted a different boundary as problematic.</p> <ul style="list-style-type: none"> - actually women didn't access record or couldn't access record - but when record data was missing, the woman was expected to recall information - woman never forgot her paper record that accompanied electronic - when patients/pregnant women become readers of their own record in line with health care professionals, they are not passive readers, but have an opinion on what a complete record entails in practice. - So they do become “responsible patients”, but not the way in which author envisaged - they become mediators between the various health care professionals, pointing to the need for constantly grooming the online record to make it carry out coordination work across the boundaries that are seen as problematic. <p><i>when a woman becomes involved in own record, she is no longer a passive member of shared team</i></p> <p><i>The paper shows that “unshared” care does not exist; care is always shared</i></p>

		<i>among human and nonhuman actors. It also points to the value of studying how boundaries are enacted in projects that seek to create continuity across boundaries.</i>
24	Jones 2002	<p><i>The Government has made the development and implementation of electronic patient records (EPRs) central to its strategy for a new, modernised NHS.</i></p> <ul style="list-style-type: none"> - variations in record keeping – <i>perceptions</i> - many records started for woman - hospital maternity file (paper), hospital maternity record (electronic), client held record (73% of staff said that this was the main record) - 35% of respondents said that they had no electronic hospital system at all - paper based records still important – <i>experience</i> - only 11% of hospital systems were linked to outside systems – <i>perception/satisfaction</i> - midwives had to - generate summaries / access histories / generate letters / track notes and access info from different departments – <i>access</i> - Negative perceptions of: time consuming, difficulty getting data in and out - in 2002, there was resistance to conform with UK national Maternity Standard guidelines - even national design paper notes were resisted as they didn't match their EHR data - <i>perception</i> <p>In 1999 it was hoped that the MCDD: 'should ensure that data are collected according to agreed definitions. This survey shows that half of the respondents had not heard of the MCDD (49%, n=71), and half had (48%, n=70), with four unsure. Of those who had, only two services had made use of it and most had not (49%, n=34).</p> <p><i>EPR developers are going to have to think about how EPR systems can contribute to midwives' clinical purpose and interests without, expecting them to devote yet more time to data entry.</i></p>
25	Jones 2004	<p><i>Paper explores the potential benefits of electronic patient records (EPR) for maternity units - from literature review, surveys, case studies</i></p> <ul style="list-style-type: none"> - confusion about what an EPR was - was it there data collecting system - midwives have a low level of interest in ICT / culture of indifference / ease of expressing disinterest and lack of competence in using EPR / computers seen in a negative light / unwilling to learn jargon / irrelevant to the business of caring for clients / taking them away from the woman / entering data was not midwives role / - some contradictions found - some were enthusiastic - some said they wanted representatives who could absorb and make sense of new

		<p>developments / only see role as viable through representatives / couldn't cope with broadening responsibilities</p> <ul style="list-style-type: none"> - one third of sites had an IT midwife - as representative - contrasting accounts of acceptance of IT midwife - existing EPR did not save midwives time - spent more time on data entry when using them - quantification impossible - although most midwives were remarkably uncritical of data entry workload - midwives complain informally but not criticising formally - generally have a level of acceptance - saw output from EPR and so saw EPR as necessary - perceived the content of questions as and data collected as appropriate - entering was a must do part of job - service had a low turnover of staff so many years to become accustomed to working with EPR
26	Henwood 2003	<p><i>The article explores the articulation of gender in the context of information and communication technologies (ICTs) in health care. It explores how gender symbolism, gender structures and gender identities combine to produce what may be perceived as 'resistance' to the development of electronic patient records (EPRs) in the maternity services.</i></p> <p>In particular, midwives define their work in opposition to computers, seeing IT work as antithetical to the core 'woman-centred' philosophy of midwifery.</p> <p>The better capture, management and use of information – analysed, communicated and shared through modern systems and networks – is central to managing change and modernising the front-line delivery of care, treatment and services to patients. It is central to improving the day to day working and skills of staff.</p> <p>In a pilot electronic health record pilot project, maternity GPs are managing to stall the project with their reluctance to 'share' their information in the way needed for the project to succeed as they feel they will be losing more than they will gain.</p> <p>While doctors and midwifery managers may have some power to shape EPR developments, the structural position of the practising midwife is somewhat different.</p> <p>In nearly half of all maternity units surveyed midwives were not consulted about either their information needs or their choice of system. This resulted in the under-use of systems that midwives simply didn't feel they had any stake in.</p> <p>Some midwives did not know or have any understanding of the EPRs</p> <p>Some midwives said that it would ruin whole point of being a midwife.</p> <p>Stressed that midwives were 'not typists' and said that she would not see that as a skill midwives should be trained for.</p>

		<p>Some midwives did complain about the amount of time they had to spend writing the notes, the time spent was seen as worthwhile in that the CHR was seen as extremely flexible – it can be used anywhere, including the birth room, and can be kept near the client at all times. In addition, it facilitates the use of the narrative style preferred by midwives. This style is preferred over the more ‘tick box’ approach used in computerized systems, which is seen as reductionist and partial, as well as awkward and time consuming to use.</p> <p>I just think it would totally ruin the whole point of being a midwife. You’re supposed to be with the woman, looking after the woman. To have a computer in the corner, where you’re away and typing into it, it’s just not part of what having a baby’s all about, to me.</p> <p>Supported the introduction of an IT midwife who could promote IT platform to facilitate better communication between IT staff and midwives, designers and users, who have tended to view each other with suspicion and sometimes hostility.</p> <p>A case is made for this role to be expanded and supported to enable both sides to move beyond their traditional spheres to engage in the ‘coproduction’ of EPR systems that are acceptable to the maternity services staff and clients.</p>
27	Hart 2003	<p><i>A survey of the Heads of Midwifery (HoMs) suggests that HoMs are more optimistic about the benefits to be gained by the introduction of electronic patient records (EPRs) than some of the evidence from their past experiences with maternity computer systems might suggest</i></p> <p>Survey showed negative perceptions of existing system - from 95 interviewees, who had an MIS, the perception was negative (43%) and positive (36%)</p> <p>Negative responses from 14 interview respondents - ranged from useless, hopeless, simply awful, poor frustrating, difficult, outdated, unsophisticated, not user friendly, time consuming, difficulty getting data in and out,</p> <ul style="list-style-type: none"> - Controversies that units experiencing with MIS are around inaccuracy, and getting poor data, need for upgrading and lack of links with PCs in community - 22 interviews mentioned unnecessary duplication, lack of interface with other departments, including community staff - Only 3 said no disadvantages - There was mention of systems not incorporating clinical or quality standards <p>Positive responses are – 13 respondents were effusive about MIS (excellent, fantastic) Although a minority, a further 19 were able to endorse MIS</p> <ul style="list-style-type: none"> - Main advantage was access to information quickly, finding it in one place,

		<p>standardising data collected and improving accuracy</p> <p>Advantages and disadvantages to clients (women) – clearer printouts / facilitation of service evaluation mentioned most frequently</p> <ul style="list-style-type: none"> - Around a half of those with an MIS said that no specific disadvantages for clients - 20% of respondents thought that midwives time was taken away from them by computers and midwife-client role was becoming depersonalised - 10% mentioned information or security as problems - Despite widespread disagreement regarding precise definition of EPR systems, over 90% of these respondents had some understanding of what an EPR was, with just 13 respondents reporting no understanding <p>Potential advantages for maternity services having MIS – there were twice as many advantages (287) as disadvantages (135)</p> <ul style="list-style-type: none"> - <i>Two main advantages to maternity services as a whole were improved access to records by other health professionals and linking of community services to hospital</i> - Easy access to records of women from other geographical areas was also helpful <p>Anticipated benefits mentioned</p> <ul style="list-style-type: none"> - Less duplication/freeing up of time / less need for paper and therefore storage - These responses were qualified by 15% of respondents with 'if EPRs were national', 'if community or GPs were involved', 'confidentiality was assured' <p>With Midwifery staff – advantages of MIS were 154 and disadvantages 15</p> <p>Anticipated disadvantages – system failure, interfacing problems - mentioned by 1/5 of respondents most frequently expressed</p> <ul style="list-style-type: none"> - Costs, lack of resources, raised by minority - fundamental doubts of EPR suppliers to understand information needs of maternity process and issue of training - raised by just 14 respondents - less 10% mentioned potential loss of client involvement in record keeping or depersonalised relationships with women <p>Not clear if paper-based record would work along side of EPR</p> <p>It was clear that respondents have assumed that some form of woman access would be facilitated by an EPR</p> <p>Advantages for women – views fairly balanced</p> <ul style="list-style-type: none"> - just under half of respondents felt that biggest advantage of EPRs for women was that health professionals would have better clinical information and that there would be fewer lost records
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		<p>Other issues mentioned were that women would be given more access to records and more information, and time saving advantages for clients were cited: less waiting, quick results, booking direct, less waiting for information.</p> <ul style="list-style-type: none"> - With regard to negative consequences for clients, the largest concern was confidentiality and data protection, with 48/128 disadvantages cited relating to this issue. - Loss of control and disempowerment, together with the potential loss of the hand-held records were seen to be relevant for some. - Only 12 of the disadvantages mentioned were concerned with the issue of women not being able to physically access computers <p><i>Despite the somewhat mixed experiences of existing systems, Management Information Systems (MIS) it appears that respondents were generally optimistic about EPRs. In some ways many of the anticipated advantages may be read as a 'wish list' — what HoMs would like EPRs to bring to the service.</i></p>
28	Shaw 2008	<p><i>RCT trial to evaluate the effect of providing pregnant women with secure access to their antenatal health records on their uptake of and satisfaction with, relevant information.</i></p> <p>2 groups are –general pregnancy health information alone (GI) and access to own antenatal record (PI)</p> <p>Entire study time – September 2004 and January 2006, mean number of log-ins to website in PI group was almost 6 times no. of log-ins in the GI group (10.4+- 17.8 vs. 1.8+- 1.4; $p<0.001$) and during last 11months of study - 84.2% of log-ins in the PI group accessed the antenatal health record</p> <p>Responses of participants to questions about website's ease of use and value in providing information about pregnancy indicated a high level of satisfaction, with no significant difference in responses between groups.</p> <p>There were no statistically significant differences between groups on any items of – ease to log on / information easy to understand / learned something new / easy to find information / helped me stay healthy / helped me learn about risks / helped me understand tests / helped me make decisions / helped me to remember appointments</p>
29	Kouri 2005	<p><i>Objective: to describe the experiences of maternity-care professionals using an Internet-based network service, called Net Clinic.</i></p> <p><i>Between 5 midwives, 2 public health nurses, 3 doctors in</i></p> <ul style="list-style-type: none"> - 1 antenatal ward in university hospital, 1 antenatal ward in central hospital, 2 community maternity clinics

		<p>Doubters - issues mentioned <i>Want things to stay the same</i> Will increase workload, lack of women's IT capabilities, no interest in adopting new technology, women like existing system, uncertain about ICT skills, middle aged afraid of computers, managers disinterested, lack of interdisciplinary co-ordination</p> <p>Acceptors - issues mentioned <i>Recognise need for change</i> Lack of information about benefits of ICT, need to show capabilities of ICT, give versatile learning, encourage participation in multiprofessional teams, giving parents enough information about available ways to participate in seamless service chain.</p> <p><i>New system reinforces the opportunities of expectant families to participate in the service chain of maternity care.</i></p>
30	Tindale 2012	<p><i>Review of technology used in electronic maternity records</i></p> <p>Failure to communicate information is common problem and a problem for parents - "don't you speak to each other"</p> <p>Means of access should never be shared – electronic allow restricted access</p> <p>Often seen as an unnecessary burden so Can make data entry easier but only if know what to enter</p> <p>Poor documentation and communication cited in enquiry in Maternal Deaths Allow providers to capture and share information safely in real time</p>

Findings for Question 3. - PHR

3. Is integration of care improved when using a paper record for teamwork, integration - (how to do things/how to report/guides/how to communicate)

	Study	Key Findings - Q3a (using paper record)
31	Lombardo 2003	<p><i>to outline the process and delivery of a system of shared care in obstetrics developed by Geelong Division of General Practice and a health division - Geelong Public Hospital</i></p> <ul style="list-style-type: none"> - use standard assessment and screening tools - have protocols and hand held record – key component of integration - to assess suitability of women , use of standard assessment and screening tools, clinical rotations through antenatal clinic, continuing professional development , protocols for GPs, process of care or plan /steps of how care should be managed - decision to join share-care is a decision made by the woman, her GP and obstetrician all of whom share the responsibility <p><i>Shared care project operating since 1994, well established and GPs, midwives, obstetricians, division personnel have ironed out problems - both GPs and patients have enhanced program and participation is good</i></p>
32	Gunn 2003	<p><i>Synopsis of GP shared care from low satisfaction to recommendations</i></p> <ul style="list-style-type: none"> - in 1994 a survey identified a low level of satisfaction with GP shared-care - only 33% of women receiving shared-care rated their care as 'very good', compared with 46% of women attending a public antenatal clinic, 72% of those attending a private obstetrician, and 80% receiving team midwifery in a birth centre - formalised framework / guidelines / communication strategy / written information / patient held records / ongoing review / accreditation guidelines / practice guidelines / funding models - patient held records are useful for communication between health providers and women - talks about using an antenatal psychosocial risk questionnaire - although sounds appealing should be tested with RCTs before

		<p>implementation</p> <ul style="list-style-type: none"> - challenges remain - GPs struggle to be heard in many tertiary hospital centres, conflicting emotions about inter-professional issues, such as role of midwife in routine antenatal care - many midwives and GPs expressed a better working relationship, that would value more respect from the other profession - this should be high on list of agenda involved in coordination of shared-care programs <p><i>Formalisation of programs has seen the re-entry of GPs into maternity arena and so have a responsibility to ensure care provided is streamlined – record part of good model</i></p>
33	Sosa 2003	<p><i>Comment re: good antenatal shared care model in Adelaide - ground breaking work from Adelaide as a result of good projects from the divisions of GP practice coming into line with state government policy priority areas</i></p> <ul style="list-style-type: none"> - Sosa identified a program that was working well - Gunn only had bad examples of shared care models. - model in Adelaide had a agreement on - single booklet (hand-held-record)- single protocol - schedule of visits - pathology schedule <p><i>GPs are motivated to provide good antenatal care – record part of good model</i></p>
34	Nel 2003	<p><i>Increase in perinatal mortality prompted a review of services to pregnant women in remote northern QLD</i></p> <ul style="list-style-type: none"> - developed an antenatal outreach visits training local members about antenatal care / duplicate record system / uss assessment / patient register - improvements in mortality rates / reduction in presentations to hospital without antenatal care - only 2 in 6 months / attendance to clinic improved -Patient had a hand held record which was designed to aid -communication between GP patient and hospital -Record ensures that necessary tests are carried out -Pts encouraged to examine and ask about entries in record <p><i>Changing settings in remote aboriginal areas can improve outcomes</i></p>

35	Field 1990	<p><i>Presents the evolution of current patterns of care and effectiveness and efficacy of the present system discussed in UK model compared with international models - Sweden</i></p> <ul style="list-style-type: none"> - recommendations were made for care providers - provide personal dignity / privacy / answer questions / - Women in Sweden become more active in care when carrying a record – this is an advantage to model of care and promoting this behaviour is good as it can be transferred to caring for the baby. - Recommendation to have women as partners - carrying record - being active in own care - also talks about psychosocial aspects of antenatal care as important fears, worries - also that antenatal education is important - problem with classes is they attract people who already have some knowledge about childbirth and often produced in a lecture format at a level too high for a mixed diversity of participants , talking replaced by films, <p><i>Current shortcomings have been reviewed and care should be shared and not duplicated - give women support</i></p>
36	Haertsch 1996	<p><i>Australian Study collecting views of midwives and obstetricians about what they considered were important components of antenatal care</i></p> <ul style="list-style-type: none"> - Important component of antenatal care was to collect them on the paper record – to organise care - However the data collected differed – most components that rated high by both groups related to the 1st visit - 90% or more of providers - antenatal assessment of BP was also rated high by both groups, <p>in 37/77 or 48% of components there was a significant difference between midwives and obstetricians ($p < 0.01$). Obstetricians placed less importance on areas that are less clinically focused such as providing opportunity for women to express fears,</p> <ul style="list-style-type: none"> - Australian study midwives and obstetricians were asked about level of importance of the identified 77 components of antenatal care (according to the National Health and Medical Research Council's Guidelines for Antenatal Care that were divided into 4 sections - including - 1st antenatal visit serology / drug counselling / BP measurement / abdo palp / family history / smoking - 2nd specific timing of tests , 3. care given at each visit, 4. organisation of care <p><i>Findings suggest that a revision of current antenatal care guidelines is necessary to better determine the necessary antenatal components required to be collected on record</i></p>

Findings for Question 3. - EHR

Is integration of care improved when using an EHR for integration, - (how to do things/how to report/guides/how to communicate)?

	Study	Key Findings - Q3a (using electronic record)
37	Bedford 2003	<p><i>Review of developments in maternity records in Scotland</i></p> <p>No results in this paper - Project teams working on new framework</p> <ul style="list-style-type: none"> - discussion around paper record components developed - including pregnancy plan / space for info / health information messages / comprehensive assessment sections - Development of an accompanying electronic version of record - must be integrated with paper record, so can be reproduced, and updated regularly, simple to use / limited training needed / secure and confidential / data items given considerable thought / integrate with other hospitals / allowing access by woman <p><i>Implementation of 'A framework for maternity services in Scotland has provided a timely opportunity to rethink maternity records - need compatible paper and electronic records that are accessible to women and staff</i></p>
38	Jackson 2000	<p><i>integration approach to address problems of communication between hospital and shared care practitioners</i></p> <ul style="list-style-type: none"> - identified clinical guidelines - developed patient held record / clear communication protocols / regular training / patient centred care focus developed / coordinated multidisciplinary approach to management guidelines. <p><i>Program created a prototype / pathway for hospitals and GPs seeking to establish a shared approach to care. - planning environment / clear and accessible guidelines / supporting records and clinical prompts / education strategies</i></p>
39	Dawson 2000	<p>Integration</p> <p>To map the provision of shared obstetric care in Victoria, and investigate the views of care providers about the ways in which current practice could be improved.</p> <p>Victorian public hospitals with births per annum and a purposive</p>

		<p>sample of hospitals with <300 births per annum were mailed a questionnaire seeking information about current practice. Interviews with key informants (n=32) were conducted at four case study sites.</p> <p>The response rate to the hospital survey was 98% (42/43). Fourteen different models of shared care were identified. Two thirds of hospitals with 2300 births per annum (16/28) had three or more different models of shared care. Six hospitals (15%) had written guidelines for all models of shared care offered; 13 (32%) had written guidelines covering some models. Practice varied considerably in relation to: exclusion criteria, recommended schedule of visits and use of patient-held records.</p> <p>There was little consensus about the content of visits and responsibility for covering particular aspects of care. Few hospitals (6/42) had written information for women about shared care. Care providers expressed divergent views regarding the question of where ultimate responsibility lies for individual patient care and for the overall management of shared care.</p> <p>The variety, complexity and fluidity of models of shared care and lack of agreed procedures contribute to difficulties experienced by both providers and women participating in shared care.</p> <p>Detailed evidence-based agreed guidelines developed in consultation with hospital and community providers, and provision of improved information to women about what to expect in shared care arrangements are urgently required.</p>
40	Angood 2010	<p><i>Symposium with five stakeholders collaborated to propose actionable strategies to move toward a high value maternity system- part of which involves using an EHR</i></p> <ul style="list-style-type: none"> - Who needs what - to, for, - clear action plan that could improve the structure process, experience and outcomes of maternity care - perceptions <p>IT should be</p> <ul style="list-style-type: none"> - increase operability / identify core elements / build on current datasets / be guided by maternity reports / create a dictionary / accomplish this through legislation / call on employers to take lead - access - should provide quality improvement funding for health IT <p><i>IT should be collaborative and use multidisciplinary input - perceptions</i></p> <ul style="list-style-type: none"> - current health IT infrastructure is built on disparate, fragmented and outdated existing information, delivery systems have been developed to meet the local needs and need to be designed on the goals and values of providing a woman and family-centred maternity care system
41	Hakkinen 2007	<p><i>Investigating the practices of an information system to integrate maternity clinics and care network</i></p> <ul style="list-style-type: none"> - a systematic and practical framework for analysing work activities to integrate

		<p>care between clinics was achieved.</p> <ul style="list-style-type: none"> - Identified needs of - Information system integration – -ICT has a fundamental impact on work -All IT applications should be integrated and have a single log-in - <i>process</i> -Clinical context should be automatically transferred from one application to another – <i>communicate</i> – -direction of need should be within maternity clinic, to family/woman/ obstetric unit/ insurance, from family laboratories/hospital <p>Hospital referrals should be electronic to facilitate ease of referral & timeliness (type of detail listed)</p> <p>Medical summaries should arrive directly into patient information management systems (PIMS) (timeliness)- <i>process</i></p> <p>Consider desktop reminders/notifications of arrival of new data – <i>communicate/process</i></p> <p>Some data not wanted in electronic form eg sensitive or uncertain information- preference for personal/phone communication</p> <p>Woman's role in information processing significant—often responsible for carrying info from one provider to another whether willing/capable or not– they should handle information more independently if capable.</p> <p>-would like a system like email, so woman data can be sent to health care team members – enables team to communicate – <i>collaborate</i></p> <p>Woman's role in information processing – she found it very important to have responsibility of care – they should handle information more independently</p>
42	Savona-Ventura 1990	<p>Savona - in 1989 - <i>EHR to improve communication between maternity health care providers and to find accurate information about women - to align with WHO - talks about the design of a person-based - that expands on traditional operated medical record - includes obstetric encounter forms, individual health profiles, antenatal and postnatal information that can link specialists services as be provided to the GP - in Malta - St Luke's Hospital and Primary health Care Centres - called CMG-COSTAR</i></p> <ul style="list-style-type: none"> - design of data fields included have been taken from Design based on guidelines - first 17 items in the broad classifications are based on the International Classification of Disease - <i>The eventual scope of the service, besides facilitating statistical analysis, is to make easily available the individual patient records to the practitioner in timely</i>

		<i>manner at each visit.</i>
43	Knowlden 2003	<p>For integration</p> <p>Report collated from the forms, reports and protocols used by the Consortium members. This was extended and refined over many months with each Division getting input from GPs and the obstetric and antenatal staff at the hospitals.</p> <p>Each data item has a description. It is also indicated if the item requires multiple occurrences (eg tests conducted on a routine visit such as blood pressure), requires free text and/or lookup tables.</p> <p>Where possible, items were linked to the National Health Data Dictionary and the General Practice Dataset. These are referred to in the notes column of the data model.</p> <p>The functional requirements for the system were also developed. These include a set of rules that range from the provision of a single login to the avoidance of duplication in data entry and the secure transmission of data.</p> <p>It also specified a number of reports that would need to be generated from the system including the Midwives Data Collection. The shared antenatal care system would increase the range of reporting options available now.</p> <p>A range of implementation issues were identified. These included:</p> <ul style="list-style-type: none"> <input type="checkbox"/> the importance of a strong antenatal shared care partnership between the GP and the hospital; ⌚ workflow changes in the hospital so that data was recorded at point of care and automated instead of a manual system; ⌚ the absence of standard protocols for antenatal shared care in NSW; ⌚ how to identify a patient as there is no unique patient identifier; ⌚ the implementation of rules for system usage such as entering data at the time of seeing the patient ⌚ the physical and technical security of the database <p>As can be seen from the above issues the majority cannot be resolved by technology alone.</p> <p>By the end of the 6 months a set of options for the system was put forward. These were divided into 3 possible solutions:</p> <p>(a) Messaging between existing sources.</p> <p>(b) Messaging using an email server to store specific patient data in a mailbox (IMAP solution)</p> <p>(c) A database that uses messaging and/or a web browser interface</p> <p>Each of these options have advantages and disadvantages that relate to such issues as cost, scope of the system, compatibility with NSW Health and Commonwealth long term strategies (eg. Point of Care and EHR), implementation and use</p>

Findings sorted

Q2

Women - Experiences using a paper hand-held maternity record

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
Elbourne 1987	Felt in control/		Ease of talking / next preg would use same record again, although higher rate in full notes - anxiousness not seen in full notes			Think full notes harder to read	Record not lost / available in clinic	
Lovell 1987	Felt comfortable / more in control		- next pregnancy full notes - 83% would use again	Those using card - only 39% would use full notes next time	More comfortable talking with staff using record - knew more about birth and analgesia ($p<0.01$) - 75% said easy to communicate with women using record - shared decision making - Preferences considered		- Involvement of fathers higher in full notes group -	

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
Homer 1999 <i>RCT - 150 women randomised to either holding entire record (intervention) OR small abbreviated card (control)</i>	Those in entire record group were significantly more likely to feel in control - 89%		Mulitparas were more likely to report that the doctor and midwife explained everything in their records to them, than multiparas who did not carry their records or primiparas from either group ($p = 0.027$). When asked in an open-ended question about their allocated method of record keeping, both groups of women were positive about their experience. were less likely to feel anxious		52% of control group said they would carry entire record next time, without having ever used it	The women who responded negatively from entire group, did so because (11%) gave reasons such as too bulky, system inconvenient and they were worried they would forget record.	These women liked having access to their results and were able to follow their own progress and felt more informed. Women felt that it gave them an opportunity to share information, particularly with their partner and other family members. This was especially important if the partner could not attend antenatal visits. women do not lose their records more often than the hospital, never forgotten notes 59% in entire record	

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
							group cw 58% in card group nor are women who have unlimited access to their records more anxious with the additional information.	
Brown 2011 <i>Cochrane - 3 trials - Elbourne / Lovell / Homer</i>			all 3 trials reported that women felt more satisfied carrying full notes all trials said that communication was improved carrying full notes		all trials reported that both full and card groups would prefer full notes in next pregnancy		Loss of Notes - trials are discordant - Lovell states that carrying full notes prevents loss and Elbourne/Homer report no difference	
Wilkinson 2007 <i>Trialling intervention of including a health behaviour screening</i>				not interested - shown to be non-feasible and no enhanced efficacy. Results from women gave preferred options for the				

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
<i>tools directing smoking cessation, nutrition, and physical activity interventions that were combined with a PHR.</i>				design of a tool to accompany the PHR.				
Webster 1996 <i>Study to determine satisfaction of women holding maternity record</i>	Results are similar to Elbourne - felt more in control	both groups mentioned fragmented care	Using a shared care record said it was more convenient (42%), more personal (27%), more information being provided (26%) Results are similar to Elbourne - high satisfaction over half said no disadvantages to shared care group					53 (36%) of women in shared care forgot record at least once

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
Phipps 2001 <i>Reactions of women holding own maternity records cw standard care of records held at hospital</i>	Information very important to women - this is synonymous with other studies did show that women thought that having record with them was important as they often forgot what was said at the visit - important to possess all their information		women thought that having full notes made them have feel more ownership, more responsible, increased confidence,		women thought that having full notes motivated them to read more about pregnancy		size of record was important - big enough to be visible shared decision making, able to share with family and friends - fostered sharing of information with partners - 'tangible link' to pregnancy 62% were concerned over losing record, although none did	62% were concerned over losing record, although none did
Kiran 2001 <i>Prospective study to find views of having access to case notes</i>	felt more in control				majority of women willing to carry record women thought records were useful	only 12.5 % knew fully the reason to carry - ??health care providers did not explain the use of the record		

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
<i>from women</i>								
Holmes 2005 <i>To trial and implement a client-held record system - (PMR) - Personal Maternity Record</i>	most thought record was useful it was a good idea (57% extremely useful)		record helped then to communicate with midwives and doctors satisfied with the way midwives and doctors explained PHR to them (38% satisfied, 46% extremely satisfied, 16% only moderately or not satisfied)		easy to use / suitable for all women.	doesn't improve documentation	never forgetting (82%)	
Draper 1986 <i>A study of women's views on carrying their medical records during their pregnancy</i>	42/88 considered that carrying the records gave them a more responsible part to play in their pregnancy		71/88 preferred full notes and 83 thought there were advantages in this policy	a few women thought that there might be something on the record that they didn't want to know about - mainly the baby	77/88 of women, all of whom were either admitted to hospital or had complications during pregnancy, found particular advantages in carrying complete record	20/88 found that which was written in their notes was difficult to understand or worrying (although a similar proportion of the control group also found the cooperation card difficult to	77/88 women thought that there were advantages for women in reading their records 30/88 thought there were advantages for	

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
<i>was conducted in Cambridge in 1982. Eighty eight women who were given their full. Full notes compared with co-op cards</i>						<p>understand)</p> <p>44/88 women found difficulties in carrying the records</p> <p>Only 12/88 (13%) women in the study carried their records with them whenever they left the house - too large for bag</p>	relatives and friends to be able to read the records	
<p>Shah 1993</p> <p><i>Pre-post intervention study – evaluation of centres in 8 countries who participated in a WHO collaborative study - changes in area where home-based maternal record</i></p>	<p>intended to improve continuity of care</p> <p>Promotes referral / early recognition of ‘at risk’ pregnancies / practical record of care / focus on education</p> <p>Women using HBMR perceived getting better care</p>		In most centres where HBMR was used, a higher proportion of pregnant women attended the antenatal clinics		<p>provide visual information to the woman to remind her</p> <p>useful in determining specific needs</p> <p>Women did keep record in good condition – welcomed plastic cover</p>			

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
<i>(HBMR) was introduced compared with area with no HBMR</i>					<p>Completion of information about pregnancy ranged from 100% in Zambia to 75% in Pakistan</p> <p>Women said that it was a 'useful passport'</p> <p>improved health education – about 40% of mother's in Egypt could recognise danger signs in pregnancy</p>			
<p>Turner 2011</p> <p><i>Review of what is current state of a Patient Held maternal record in developing countries</i></p>	confidence, control, better informed, satisfaction, interaction were repeated				increasing utility of patient held record was to improve education		Loss of record not a significant issue	

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
Mahomed 2000	Deemed record to be important Mothers felt more involved in the pregnancy				All records available were kept in good condition Also to show husbands	(49.1%) of women presented as available Might be due to movement of women, inability to travel long distances or unwilling to carry the record		
Patterson 2002		36% said that antenatal record card had little impact on care 2 responses said that doctors held their records and refused to replace when went missing						
Wood 1991			More satisfied with communication with doctors				Enjoyed carrying records	
Thomas 1987			Satisfaction with communicating with practitioners					

Study	perceptions		satisfaction		usability		access	
	<i>Positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>Not difficult</i>	<i>difficult</i>
			56% said they would prefer to have shared-care with GP, midwife and obstetrician.					

Hospital Clinicians - Experiences using a paper hand-held maternity record

Study	Perceptions		satisfaction		usability		access	
	<i>positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>easy</i>	<i>difficult</i>
Lovell 1987							Full notes saved time as medical charts did not have to be retrieved	
Wilkinson 2007 <i>Trialling intervention of including a health behaviour screening tools directing smoking cessation, nutrition, and physical activity interventions that were combined with a PHR.</i>				reported that enhanced PHR was time consuming and repetitive / increased workload				
Toohill 2006 <i>This paper explores the return</i>							4 audits conducted over a 2 year period to determine	When notes not available have no choice but to act on information from health facility. - and

<i>rate of the pregnancy handheld record in a major tertiary facility</i>							rate of return. An increase in return of 6.6 % was noted - overall return rate of 85%.	legally where do clinicians stand
<p>Holmes 2005</p> <p><i>To trial and implement a client-held record system - (PMR) - Personal Maternity Record</i></p>			it helped them talk to women (19% extremely useful, 42% useful, 35% moderate or not useful)			more staff training useful		<p>most common response from midwives is that record is forgotten (77%) - at appointments, admissions, additional comments, document when does not present for visit</p> <p>doctors reported most common problem as not being able to retrieve info quickly (88%) - not enough room for recording problems/admissions, no room for originality</p> <p>GP accessed record - 27% never asked, 16% occasionally, 51% every visit</p>

<p>Draper 1986</p> <p><i>A study of women's views on carrying their medical records during their pregnancy was conducted in Cambridge in 1982. Eighty eight women who were given their full. Full notes compared with co-op cards</i></p>				<p>practitioners worried about women knowing about something difficult – such as problem with baby - but women also said that they didn't want anything kept confidential from them</p>				
<p>Turner 2011</p> <p><i>Review of what is current state of a Patient Held maternal record in developing countries</i></p>			<p>developed country - improvement in communication, access and care</p> <p>– developing country - preventative measures of detecting risk and increasing educational opportunities</p>		<p>Positive benefits in compliance with patients, generally willing to carry record although some did not use record at all</p>			

Mahomed 2000					TBA's felt record helped them to educate the women using pictures			
Patterson 2002	93% positive perception				Effective tool even if hard to read, incomplete			
Thomas 1987		Thought most advantages were with the women				More administration work, especially for midwife		

GPs - Experiences using a paper hand-held maternity record

Study	Perceptions		satisfaction		usability		access	
	<i>positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>easy</i>	<i>difficult</i>
Thomas 1987								Problems communicating with midwives
Halloran 1992							Continuity of care important. Record good for communication	

Women - Experiences using an electronic maternity record

Study	Perceptions		satisfaction		usability		access	
	<i>positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>easy</i>	<i>difficult</i>
<p>Wackerle 2010</p> <p><i>Comparing maternity notes on a USB with control who didn't use USB</i></p>	<p>feeling of safety</p> <p>80.5% felt safer of USB group</p> <p>overall positive impression of stick</p>		<p>overall satisfaction with pregnancy and delivery</p> <p>98.5% wished to repeat USB experience / of controls</p> <p>86.5% would have appreciated the experience</p>	<p>few concerns over confidentiality (12%)</p>	<p>2/3 used USB regularly ¼ after every consultation</p> <p>32% never connected to computer and 11% did have access to a computer.</p> <p>USB did not need to be opened to experience reassurance</p>		<p>partner involvement</p> <p>7.5% of USB group shared stick with a doctor outside of the department</p>	
<p>Winthereik 2008</p> <p><i>The paper seeks to examine how an online maternity</i></p>	<p>When pregnant women become readers of their own</p>							<p>actually women didn't access record or couldn't access record</p>

<i>record involving pregnant women worked as a means to create shared maternity care</i>	record in line with health care professionals, they are not passive readers, but have an opinion on what a complete record entails in practice							<p>but when record data was missing, the woman was expected to recall information</p> <p>woman never forgot her paper record that accompanied electronic</p> <p>woman assumes responsibility to remember information when missing</p>
<p>Shaw 2008</p> <p><i>RCT trial to evaluate the effect of providing pregnant women with secure access to their own antenatal health records OR access to a general antenatal information site</i></p>			website's ease of use and value in providing information about pregnancy indicated a high level of satisfaction with internet use as such – no difference between groups		There were no statistically significant differences between groups on any items of – ease to log on / information easy to understand / learned something new / easy to find information / helped me stay healthy / helped me learn about risks / helped me understand tests / helped me make decisions / helped me to remember appointments		Both groups showed ease of use	

Hospital Clinicians - Experiences using an electronic maternity record

Study	Perceptions		satisfaction		usability		access	
	<i>positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>easy</i>	<i>difficult</i>
Fawdry 2010 <i>Overview of maternity information technology in Britain, questioning usability, effectiveness and cost efficiency of the current models of implementation of electronic records</i>	<i>Perception of more reliable / faster transmission / reduction in medical errors / access anywhere / legible / better quality / offsite backup</i> <i>EEPD have potential to improve quality of electronic and paper records to improve international standards – <u>perception</u></i>	these projects have predicted a paperless future - but in reality paper will continue to be necessary to store information about pregnancy in different places			has been expensive in design and implementation and also in midwife hours of entering data	paper data will need to be transferred to a computer dataset replacing paper with 'master copy' is undesirable and impractical		replacing paper with 'master copy' is undesirable and impractical
Curly 2012					while Fawdry speaks about lack of standards in maternity records.			

					With a pragmatic approach, scanning records is the way to keep the richness of the records			
<p>Homer 2010</p> <p><i>The trialling of a maternity electronic health record, using a 'Obi-MATE' - PDA (personal digital assistant)</i></p>	feedback positive-recommendations				<p>need foldout keyboard</p> <p>option to add details in discussion fields / links to educational websites / obstetric calculator needed</p> <p>need for more woman friendly terminology required</p> <p>need to keep sensitive info confidential</p> <p>could have inbuilt language translator</p>	<p>ability of staff to navigate OBI-MATE was a limitation</p> <p>cost not thought to be prohibitive, although initial rollout would be expensive</p>		<p>access for women at home was potential problem as in 2008 - 67% of households had home internet and 75 % has access to a computer</p>
<p>Winthereik 2008</p> <p><i>The paper seeks</i></p>	Envisaged that woman would become							<p>obstetrician frustrated that entries aren't in EMR</p>

<i>to examine how an online maternity record involving pregnant women worked as a means to create shared maternity care</i>								Thinks that woman should not be responsible for remembering information -
Jones 2002 <i>Survey of maternity unit on acceptance of a maternity EPR</i>						<p>many records started for woman - hospital maternity file (paper), hospital maternity record (electronic), client held record (73% of staff said that this was the main record)</p> <p>generate summaries / access histories / generate letters / track notes and access info from different</p> <p>- time consuming, difficulty getting data in and out</p>		<p>only 11% of hospital systems were linked to outside systems</p> <p>departments</p>
Jones 2004	but when they could see clinical value were more	confusion about what an EPR was - was it		Not all saw role of IT midwife as	although most midwives were remarkably	spent more time on data entry when using them -		

<p><i>Paper explores the potential benefits of electronic patient records (EPR) for maternity units - from literature review, surveys, case studies</i></p>	<p>accepting</p> <p>but when they could see clinical value were more accepting</p>	<p>there data collecting system</p> <p>midwives have a low level of interest in ICT / culture of indifference / ease of expressing disinterest and lack of competence in using EPR / computers seen in a negative light / unwilling to learn jargon / irrelevant to the business of caring for clients / taking them away from the woman / entering data was not midwives role /</p>		<p>important</p>	<p>uncritical of data entry workload</p>	<p>quantification impossible -</p>		
<p>Henwood 2003</p> <p><i>It explores how gender symbolism,</i></p>	<p>Doctors and midwifery managers may have some power to shape EPR</p>	<p>Some midwives did not know or have any understanding of the EPRs</p>						

gender structures and gender identities combine to produce what may be perceived as 'resistance' to the development of electronic patient records (EPRs) in the maternity services.	developments	<p>Some midwives said that it would ruin whole point of being a midwife - You're supposed to be with the woman, looking after the woman. To have a computer in the corner, where you're away and typing into it, it's just not part of what having a baby's all about, to me</p> <p>Stressed that midwives were 'not typists' and said that she would not see that as a skill midwives should be trained for.</p>						
Hart 2003 A survey of the Heads of	Anticipated advantages – Less	Most frequent anticipated disadvantage (about 1/5 th of respondents) –					Women would have more access to records – less waiting	

<p><i>Midwifery (HOMs) suggests that they are more optimistic about the benefits to be gained by the introduction of electronic patient records (EPRs) than some of the evidence from their past experiences with maternity computer systems might suggest</i></p>	<p>duplication/freeing up of time / less need for paper and therefore storage</p> <p>These responses were qualified by 15% of respondent s with 'if EPRs were national', 'if community or GPs were involved'</p> <p>And 'confidentiality was assured'</p> <p>Twice as many advantages were cited than disadvantages – small degree of reservation</p>	<p>interfacing problems</p>					<p>time and quicker access to results</p>	
<p>Kouri 2005</p> <p><i>to describe the experiences of maternity-care professionals</i></p>	<p>Providers had positive attitudes towards internet based system</p> <p>Acceptors thought</p>	<p>not all interested in computer</p> <p>thought that mothers wanted</p>			<p>Providers found that fathers' generally had a technical understanding</p> <p>Doubters found it easier to file through</p>	<p>Reliable use was important</p>		<p>Privacy issues considered important</p>

<i>using anInternet-based network service, called Net Clinic</i>	<p>it would encourage participation in multi-professional teams</p> <p>It would give parents enough information about available ways to participate in seamless service chain.</p>	<p>to have personal contact with providers rather than with computer</p> <p>some thought that there was a lack of interdisciplinary co-ordination</p>			<p>papers rather than browse computer</p> <p>Concerned about skills</p> <p>.Not all had computer at home and so couldn't look up patient details at home</p> <p>.</p> <p>.</p>			
<p>Tindale 2012</p> <p><i>Review of technology used in electronic maternity records</i></p>	<p>Allow providers to capture and share information safely in real time</p>	<p>Often seen as an unnecessary burden so</p> <p>Can make data entry easier but only if know what to enter</p>		<p>Failure to communicate information is common problem and a problem for parents – “don't you speak to each other”</p> <p>Poor documentation and communication cited in enquiry in Maternal Deaths</p>	.		<p>Means of access should never be shared – electronic allow restricted access</p> <p>Editing trail easier to determine causes of errors - safer world</p> <p>Anybody can view paper notes</p>	

General Practitioners - Experiences using an electronic maternity record

Study	Perceptions		satisfaction		usability		access	
	<i>positive</i>	<i>negative</i>	<i>yes</i>	<i>no</i>	<i>useful</i>	<i>difficult</i>	<i>easy</i>	<i>difficult</i>
<p>Winthereik 2008</p> <p><i>The paper seeks to examine how an online maternity record involving pregnant women worked as a means to create shared maternity care</i></p>								<p>Woman asked GP to fill in lab results missing on her copy of electronic record</p>
<p>Henwood 2003</p> <p><i>It explores how gender symbolism, gender structures and gender identities combine to produce what may be perceived as 'resistance' to the development of electronic patient records (EPRs) in the maternity services.</i></p>						<p>GPS managing to stall EPR project with reluctance to share information – they think they will be losing more than gaining</p>		

Paper record - integration of care improved for teamwork (integration, collaboration, clinical input and process deliverables)

Study	teamwork (collaboration)		clinical input (results, visit data)		process deliverables (how to do things, reporting, guides, communication modalities)	
	<i>positive</i>	<i>negative</i>	<i>positive</i>	<i>negative</i>	<i>positive</i>	<i>negative</i>
Lombardo 2003			uniform pathology schedule, schedule of visits		<p>Key component is paper hand-held record</p> <p>Included in a process of delivery in a system of shared care in Geelong – established in 1994</p> <p>Also developed standard assessment and screening tools, clinical rotations through antenatal clinic, professional development, protocols, plans of care</p> <p>Decision making is joined with women, GP and obstetrician –</p>	

					Aim to all share responsibility	
Gunn 2003		<p>Challenges remain GPs struggle to be heard in many tertiary hospitals, conflicting emotions about inter-professional issues, such as role of midwife in routine antenatal care</p> <p>Many midwives and GPs expressed / desired a better working relationship, that would value more respect from the other profession</p> <p>This should be high on list of agenda involved in coordination of shared-care programs</p> <p>in 1994 a survey low level of satisfaction with GP shared-care - only 33% of women</p>	<p>Including psychosocial risk questionnaire</p> <p>uniform pathology schedule, schedule of visits</p>	<p>although sounds appealing should be tested with RCTs before implementation - this hasn't happened to date</p>	<p>gives a synopsis of antenatal care and where it is going in 2003, - - formalised framework / guidelines / communication strategy / written information / patient held records / ongoing review / accreditation guidelines / practice guidelines / funding models</p> <p>patient held records are useful for communication between health providers and women</p> <p>Formalisation of programs has seen the re-entry of GPs into maternity arena and so have a responsibility to ensure care provided is</p>	

		receiving shared-care rated their care as 'very good', compared with 46% of women attending a public antenatal clinic, 72% of those attending a private obstetrician, and 80% receiving team midwifery in a birth centre			streamlined – record part of good model	
Sosa 2003	<p><i>ground breaking work from Adelaide as a result of good projects from the divisions of GP practice coming into line with state government policy priority areas - Sosa identified a program that was working well</i></p> <p>GPs are motivated to provide good antenatal care – record part of good model</p>		uniform schedule of visits both in hospital and GP clinic,		single accreditation and continuing education , single booklet (hand-held-record)- single set of protocols, including inclusion, exclusion and referral , uniform schedule of visits both in hospital and GP clinic,	
Nel 2003			<p>USS assessment</p> <p>Record ensures that</p>		Patient register, training local members, uss assessment	

			<p>necessary tests are carried out</p> <p>Pts encouraged to examine and ask about entries in record</p>		<p>Changing settings in remote aboriginal areas can improve outcomes</p> <p>Patient had a hand held record which was designed to aid communication between GP patient and hospital</p>	
Field 1990					<p>Women in Sweden become more active in care when carrying a record – this is an advantage to model of care and promoting this behaviour is good as it can be transferred to caring for the baby.</p> <p>psychosocial aspects of antenatal care as important - fears, worries - also that antenatal education is important - problem with classes is they attract people who already have some knowledge about childbirth and often produced in a lecture format at a level too high for a mixed diversity of participants , talking replaced by films -</p> <p>Some Current shortcomings have been reviewed and care should be</p>	

						shared and not duplicated - give women support
Haertsch 1996			<p>4 sections - including</p> <ul style="list-style-type: none"> - 1st antenatal visit serology / drug counselling / BP measurement / abdo palp / family history / smoking - 2nd specific timing of tests 3. care given at each visit 4. organisation of care <p>- Important component of antenatal care was to collect them on the paper record – to organise care</p>	<p>there was some discrepancy between midwives and obstetricians views - in 37/77 or 48% of components there was a significant difference between midwives and obstetricians ($p < 0.01$).</p> <p>Obstetricians placed less importance on areas that are less clinically focused such as providing opportunity for women to express fears,</p>		
<p>Bedford 2003</p> <p>SWHMR (Scottish women held maternity record)</p>					<p>to enhance communication between women and multidisciplinary teams, including GPs</p> <p>personalise records, pregnancy plan, record of health behaviours</p>	
Patterson 2002						Lack of compliance recording on record,

						adversely influenced professional practice and negated any flow on effect for women
Wood 1991					Integrated care using PHR can improve communication, duplication of visits, improved attendance,	
Thomas 1987					Record part of a process that improved duplication of visits – unclear if it helped communication	
Halloran 1992					Paper record important in facilitating communication between GP and maternity hospital Also shared-care co-ordinator important	
Jackson 2000	patient centred care focus developed / coordinated multidisciplinary approach to management				integration approach to address problems of communication between hospital and shared care	

	guidelines.				<p>practitioners / regular training / Program created a prototype / pathway for hospitals and GPs seeking to establish a shared approach to care. - planning environment / clear and accessible guidelines / supporting records and clinical prompts / education strategies / identified clinical guidelines</p> <p>developed patient held record / clear communication protocols / regular training</p>	
Dawson 2000	Perceived benefits not yet realised				<p>PHR, schedule of visits, written guidelines, co-ordination and management of shared-care programs important for shared-care</p> <p>PHR main tool for communicating between care providers</p>	<p>Not all GPs made use of PHR's</p> <p>Thought changes could be made to PHR</p>

Electronic record - integration of care improved for teamwork (integration, collaboration, clinical input and process deliverables)

Study	teamwork (collaboration)		clinical input (results, visit data)		process deliverables (how to do things, reporting, guides, communication modalities)	
	<i>positive</i>	<i>negative</i>	<i>positive</i>	<i>negative</i>	<i>positive</i>	<i>negative</i>
<p>Hakkien 2006</p> <p>(maternity clinic outside hospital, sharing info with hospital)</p> <p>Using old electronic system</p>	<p>Identified needs of - Information system integration – -ICT has a fundamental impact on work</p> <p>Woman's role in information processing – she found it very important to have responsibility of care – they should handle information more independently / would like a system like email, so woman data can be sent to health care team members – enables team to communicate <i>collaborate</i></p>	<p>Current maternity system is stand alone between applications – using several log-ins</p> <p>Lack of conversations between providers</p> <p>Currently systems are paper and</p>	<p>hospital referrals should be electronic to facilitate ease of referral & timeliness (type of detail listed) / Medical summaries should arrive directly into patient information management systems (PIMS) (timeliness)</p>	<p>Some data not wanted in electronic form eg sensitive or uncertain information- preference for personal/phone communication</p>	<p>All IT applications should be integrated and have a single log-in - <i>process</i></p> <p>Clinical context should be automatically transferred from one application to another – <i>communicate</i> – -direction of need should be within maternity clinic, to family/woman/ obstetric unit/ insurance, from family laboratories/hospital /</p> <p>Consider desktop reminders/notifications of arrival of new data</p>	<p>Focus not on IT alone but to connect 'social and technology'</p>
Angood 2010	- IT should be	- current health IT			clear action plan that	Currently outdated

	collaborative and use multi-stakeholder input	infrastructure is built on disparate, fragmented and outdated existing information, delivery systems have been developed to meet the local needs and need to be designed on the goals and values of providing a woman and family-centred maternity care system.			could improve the structure process, experience and outcomes of maternity care - perceptions	
Savona-Ventura 1990					in 1989 - <i>EHR to improve communication between maternity health care providers and to find accurate information about women - to align with WHO - talks about the design of a person-based - that expands on traditional operated medical record - includes obstetric encounter forms, individual health profiles, antenatal and postnatal information that can link specialists services as be provided to the GP - in Malta - St Luke's Hospital and Primary health Care Centres - called CMG-</i>	

					<p>COSTAR</p> <ul style="list-style-type: none"> - design of data fields included have been taken from Design based on guidelines - first 17 items in the broad classifications are based on the International Classification of Disease - <i>The eventual scope of the service, besides facilitating statistical analysis, is to make easily available the individual patient records to the practitioner in timely manner at each visit.</i> 	
<p>Knowlden 2003</p> <p>consortium established to develop an electronic information system that would link hospital obstetric departments with GPs providing shared-care</p>					<p>dataset requirements linked to National Health Data Dictionary and General Practice Dataset.</p> <p>Specified reports options.</p> <p>Protocols developed, messaging, rules for data entry and visits</p>	

					need to be timely	
Bedford 2003 eSWHMR (e-Scottish women held maternity record)					<p>electronic record to be well integrated with the PHR</p> <p>Accessible from many sites, security important, avoid duplication</p>	

Appendix 6. Comparison of the Paper and Electronic Fields

PHR – Paper hand-held record		EHR – Electronic health record	
<i>Pages are divided into sections of:</i>		<i>Icons viewed through patient portal:</i>	
		Information entered into EHR by health care providers	
Pages 1 to 3	<i>Mother and general practitioner details</i>	Antenatal history	<i>History recorded early in pregnancy</i>
Pages 4 to 5	<i>Important antenatal signs and symptoms of concern Birth preferences</i>	Issues and plans	<i>Identified medical and obstetric issues and management plans</i>
Pages 6 to 7	<i>Baby feeding intentions, glossary and what to bring to hospital, additional notes section</i>	Healthcare providers	<i>Details about the providers of maternal care</i>
Pages 8 to 9	<i>Antenatal visit schedule and care checklist</i>	Antenatal visits	<i>Summaries of visits to clinicians for antenatal care</i>
Pages 10 to 11	<i>Father and mother health history Previous pregnancy information</i>	Test results	<i>Results of laboratory and ultrasound tests</i>
Pages 12 to 13	<i>Laboratory and ultrasound results Medical and obstetric issues and management plans</i>	Reports	<i>Pregnancy reports to view and print</i>
Pages 14 to 17	<i>Fundal height chart Visit notes</i>	Details recorded by women	
Pages 18 to 20	<i>Tobacco and alcohol screening Additional scheduling section</i>	Notes/questions	<i>To record my notes and questions for providers</i>
		Birth preferences	<i>Preferences for birth and postnatal care</i>

Appendix 7: Full Interview Schedule

Phase 1. – Using Paper record

Initial interview schedule for Women using a Paper Maternity Record (will have PHR copy on hand to look at and provide brief overview of record and project, talk about electronic record too)

1. What does good quality antenatal care mean to you? (perception)

2. How does the PHR fit into this?

3. Why do you think you have a paper hand-held maternity record? (Experience)

Probe: provide information / transfer of information / control of care / concise info in one place

4. What do you think the good things are about the paper record? (Experience/perception)

Probe: easy to carry / easy to follow

5. Which parts of the record do you use, read or write in? (Experience)

Probe: birth plan / any questions / antenatal checklist

6. Are there parts of the record you don't understand? (Experience)

- If yes, which parts and what aspects

Probe: is it because of handwriting / too detail

7. What do you think could be improved on the paper record? (Experience/perception)

Probe: hard to read or follow / more space to write questions / too much information

If multiparous – have you had issues at delivery with your record

8. Do you think the record helps to co-ordinate / co-ordinate your care, between health care providers? (Integration/team work)

Probe: liaise / communicate / pass on information / is information fragmented, not consistent or unified / have visit with more than one person of health team at same time / were your preferences considered/moving between hosp and GP- do you think midwives and GPs communicate well – does paper record help with this

9. Do you think having the record, has equipped you with enough educational material / information needed for delivery and after the birth of your baby? (narrative outcome)

Probe: how could it be improved / what part of pregnancy, delivery did you really want to find out about at your visit – eg. Breastfeeding and did it happen

10. Does your partner look at your paper record? (Experience/outcome)

Probe: for results / visit info / which parts of record

11. Is there something else you think I should know in order to understand your experience with using the paper record? (Experience)

Page 1 of 2

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Phase 1. – Using Paper record

Will talk about the electronic record now (give overview of MSEHR and sample pages)

12. Have you ever used or been involved in use of an electronic health record and for what reason?
(Experience)

Probe: previous hospital / relative has used

13. Tell me about your experience, using a computer? (Experience)

Probe: computer at home or work / use to search, like Google / any other use

14. Given your experience, how do you feel about an electronic record, instead of a paper record?
(Experience)

Probe: apprehensive / feel it would improve care, communication

15. What would be the best way for you to use an electronic health record? (perception)
USB / phone / ipad app / other choice

16. What do you think the issues would be with an electronic record? (perception)

Probe: benefits / problems / privacy / security

17. Would your partner be more interested in looking at your record, if it were electronic?(perception)
easier to access / understand / yes- no

Just to finish

18. Is there anything else you would like to comment on regarding your paper record?

Appendix 8. Phase 1 Woman's Interview Transcription

Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
Page 1	Antenatal Care	Yeah. Especially in the beginning stage, it was very bad; she got really bad vomiting, morning sickness, so -				
Page 2	PHR helps with information	We got the book. Yeah, it's all together	Information all together	Phys	Physical usability	Perception
	PHR helps with communication in care	I think it was with the doctor, she explain us. GP. She said there's got to be a bible for the whole pregnancy and (3.10) so the GP knows what's going on in the hospital for her. Yeah.	Used for whole pregnancy	HCP	Participate with HCP	Using
Page 3	Most useful parts of record	Yeah. So you have - did you look at this schedule so you could find out when you were, when your next visit was - - -. Yeah, that's the most useful part, yeah.	Schedule used the most	Imp	resources	Content
Page 3		Yeah, yeah, it explains you, the day you're supposed to come and what will happen here.	Schedule used the most	Prep	Prepare	purpose
Page 4		It kind of helped us to prepare to go to the GP and said what can be asked to the GP.	Schedule used the most	Prep		

					prepare	Purpose
Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
		Every appointment they will write down what is going to be the next appointment so it's less confused.	Schedule used the most	Prep	prepare	Purpose
		What to bring to hospital. What to bring to the hospital is one thing. And the various different options to go to the labour, what sort of pain relief.	Birth preferences	prep	Prepare	content
Page 5	Who did you use PHR with	Really, some of our friends, they already went through this.	Used with friends	Fam	Participation with family	Using
Page 5		We talk with GP as well.	Used with GP	HCP	Participation with HCP	Using
	Educational references	And we've been to the antenatal classes, so, information	Antenatal classes		resources	Content
	Who did you use PHR with	He really didn't explain much at all. It's mainly we got information from (6.15) and we can put information from the hospital, the GP as well. GP says, "Ok the hospital will explain everything."	Confusion GP	Con	Confusion	Perception

Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories/sub themes	Overarching Themes
		When we came here they said, "Oh, your GP might have already explained everything." [Laughs]. They said, "No, it's GP's job." Then we went back to GP, it's hospital's job.	Used with hospital staff Confusion	Con	Confusion	Perception
Page 6	Educational resources	Appointments here. They gave us a form or something telling you about the antenatal class whether we	Antenatal classes not referred to in record	Edu	resources	Content
Page 7	How did you find using PHR	- - - so you were aware that you needed to - you were obliged to hold it in your bag? A: Yeah. Q: And was that okay doing that? A: Yeah. Q: It's quite a small document, isn't it? A: Yeah.	Held PHR by self in bag	Phys	Physical aspects	Perception
Page 7		It's important for 1 st baby	Important	Imp clinical	Prepare	Perception
Page 8	Good parts of record	Yeah. We got help there, because then I started asking GP about the vaccinations and GPs thoughts on that as well, especially whooping cough and that sort of thing so, yeah, that's, we got it from this	Vaccinations	Other imp	resources	Content

		record.				
Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
Page 9	Which parts don't you use	Let me see. (10.02) alcohol. No	Don't use alcohol parts	NR	Non relevant	Content
Page 9	Are results important to you	Yeah. They always go through that. Yeah.	Results section	Imp clinical	clinical results	Content
Page 9		Yeah. The GP just talk to us about whether it's okay or it's not normal.	Results discussed	HCP	Participate with HCP	Using
Page 10		She explained everything but it works so - -	Results discussed	HCP	Participate with HCP	Using
	Refer to results	No. No. We don't.	Don't look at results		Non-relevant	Content
Page 10	Helped with other information	The only thing, they give another paper anyway for that. The information is on the symptoms of labour; what will happen and when do you have to come to the hospital.	Labour information from another source - paper	Res	resources	Content

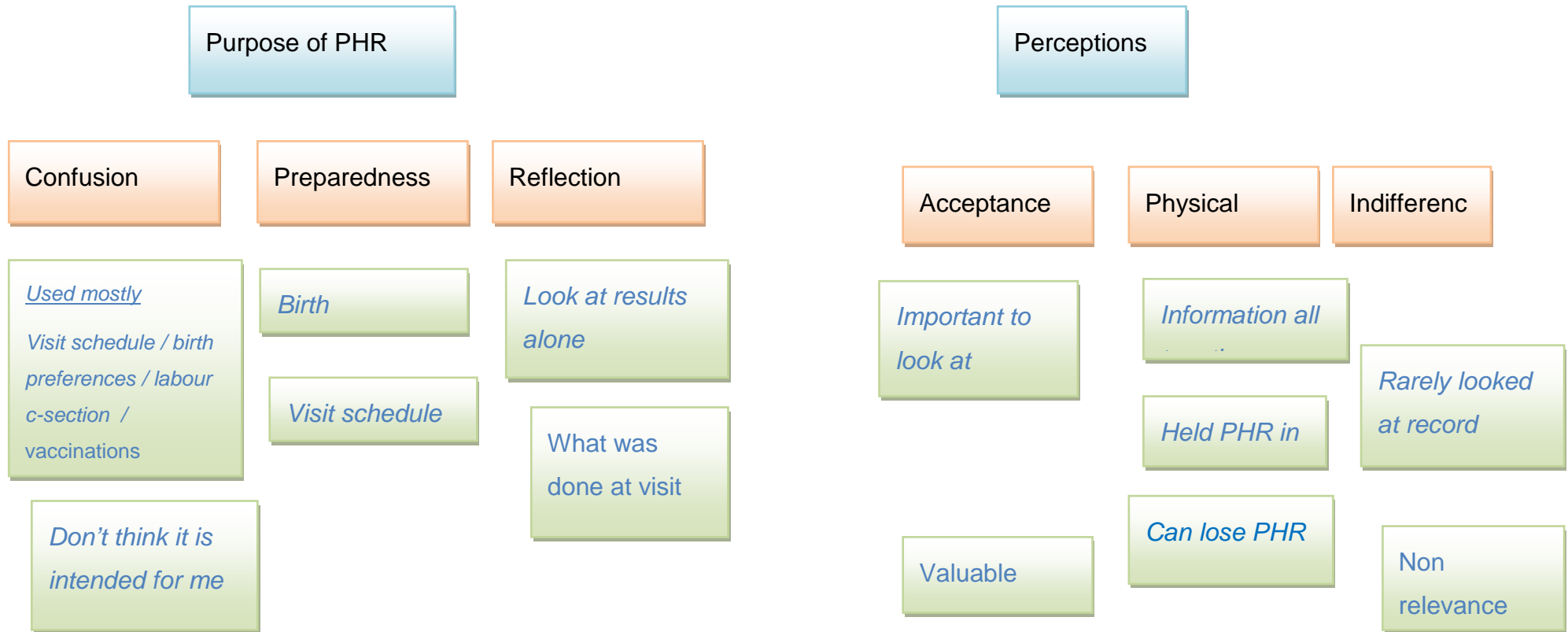
Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
Page 11		Right, right. So, the record didn't have that but you did get it from another place? A: Yeah, yes. Yes	Labour information from another source - paper	Res	resources	Content
	Did you see anybody else in pregnancy – like physio	No				
Page 11	Was PHR a good communication tool between the hospital, GP and you	It's mainly between the doctors, I mean the hospital and the GP,	Helped with communication between hospital and GPs	HCP	Participate with HCP	Using
Page 11		and for us it's more important and to get the days and when we had to go to GP, when we had to go to hospital. So that sort of, and the last page about preferences and that sort of thing.	Helped with visit scheduling	Prep	Prepare	Purpose
Page 12	Any issues with PHR – parts missing	There was something. Recall to something (13.50). About the results of some scanning and piece of (13.52) it's not there and they might have to take somewhere else.	Scanning results missing	MI	Missing info	Content
Page 13		Midwife had to find results Yeah. Because the radiologist, they sent	Scanning results missing	MI	Missing info	Content

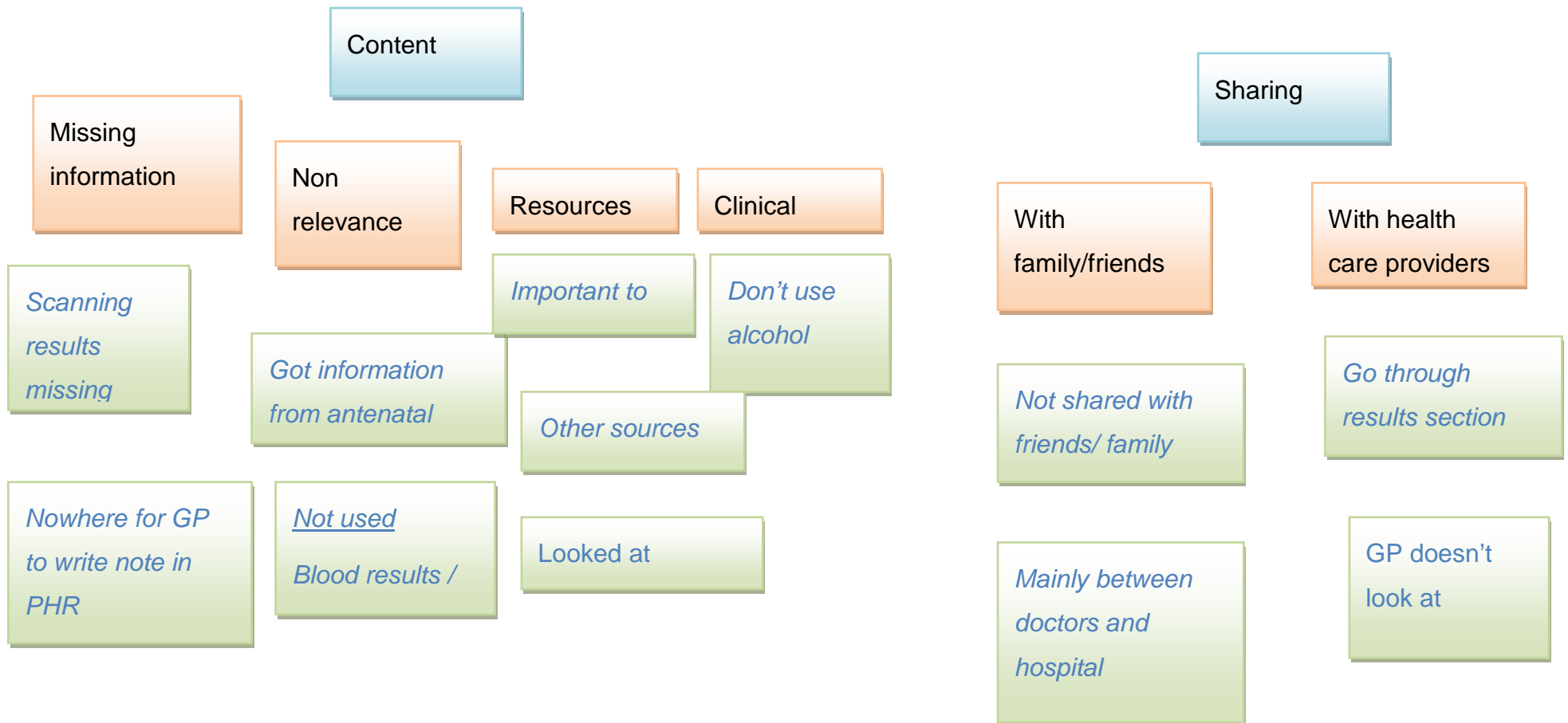
		records to GP not here, and GP supposed to communicate with the hospital. And she communicate via something else, rather than here				
Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
	Find record useful	Overall useful	Easy to use	Phys	Satisfaction	Perception
	Would you use an EHR	Yeah			Interest in EHR	Usability
Page 14		Yeah. But what I'm thinking right now is the only thing about the electronic thing is you have to log in to see the dates that you have to go. Whereas, here it's (16.44).	Have to log into EHR	Disadv	Possible disadvantages	Interest in EHR
	Using an EHR	It's fine, (16.59) laptop, that's not an excuse, but it's more like it's always like (17.07). It's not an issue, yeah. It's one thing, yeah.	Ok to have to log in	Disadv	Possible disadvantages	Interest in EHR
Page 15	Benefits of EHR	Electronic, one thing you go forward, you don't have to carry anything, so it's there. That's one thing and that the reading, they type everything rather than	EHR convenient to use	Adv EHR	Possible Advantages of EHR	Interest in EHR

Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
Page 16	What access to computer	Yes. And convenience, we've got the iPad, that sort of thing so you can access anywhere, so – Mobile phone access	EHR convenient to use	Adv EHR	Possible Advantages of EHR	Interest in EHR
Page 16	Partner using an EHR	Yeah. We do that smart phone, so. Probably the easiest you can access.	EHR convenient to use	Adv EHR	Possible Advantages of EHR	Interest in EHR
Page 16	Benefits of EHR	That's what I think this is like. You can see all the time and you have a look and you see that. Apart from that, (18.31).	EHR convenient	Adv EHR	Possible Advantages of EHR	Interest in EHR
Page 17	Are you worried if don't have PHR with you	The paper one. You can lose it.	Might lose PHR	Phys	Physical usability	Using
	Do you have PHR with you all of the time	Yeah. All the time, yeah.	Haven't ever forgotten PHR	Self	Self using	Using
	Would EHR help communication with providers	Yeah, it be more (19.30) try and take all the records.	EHR would have all records	Adv EHR	Possible Advantages of EHR	Interest in EHR
Page 18	Has PHR helped with labour	Not, it's mostly about the preferences.	Hasn't helped with labour information	Edu	Educational resources	Using

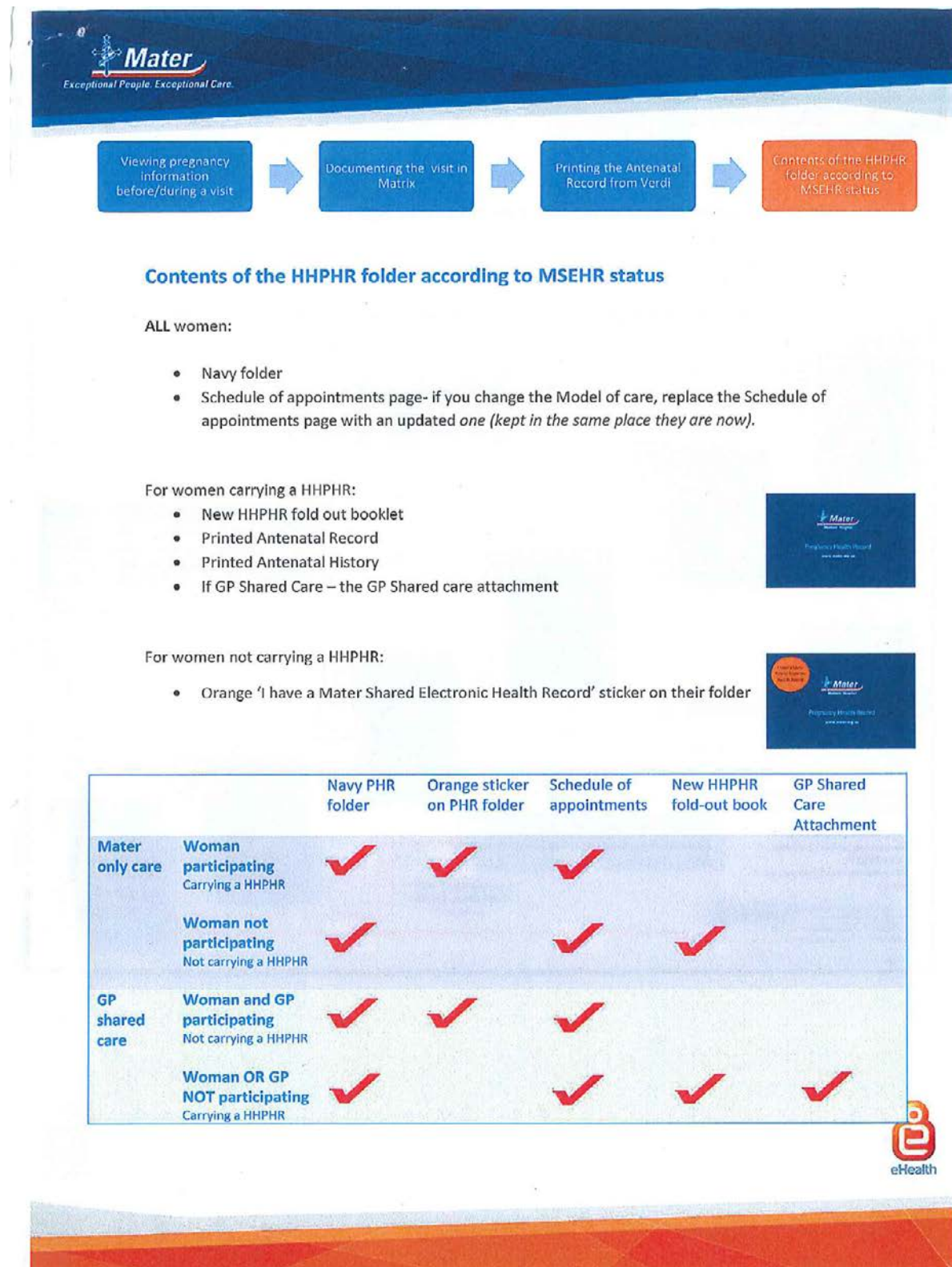
	What has PHR helped with	Has helped with telephone	Helped with contact details	Other imp	Other important info	Data
Interview Page	Question in Interview	Comments from interview (examples)	Subcategories	Code for Subcategories	Categories	Overarching Themes
Page 18	Any other info about PHR	There was one thing to say, which was like all feeling there's no place to write in (20.55).	No place to write in	Phys	Physical usability	Perception
Page 19		Oh, the GP. The GP had to write somewhere else. Yes.	GP had to write in computer - no place to write in	Phys	Physical usability	Perception
Page 20	Benefit of EHR	So online you won't get that issue or anything. You get plenty of - - -	EHR won't have issue with space	Adv EHR	Possible Advantages of EHR	Interest in EHR

Example of women's coding thematic map





Appendix 9. Full Workflow Steps



Appendix 10: View of Health Summary Sheet Generated from the EHR



By clicking here, you can increase the Antenatal Record size to fullscreen size

File View V-Notes Tools Window Help

Patient Explorer Patient Record

RAU 056

Latest 20 Pathology Results Pregnancy Details Antenatal Record EDC: 11/05/2012

Refresh and Print

Antenatal Record

Name: MRs [Name]	DOB: 03-06-1975	URN: [URN]
Agreed EDB: 11-09-2012	Gravida: 3	Parity: 2
Model of Care: GP shared care		

Issues and Plans Recorded by Mater Clinicians

26 Apr 2012	Allergy: Not known: Seaford and/or Iodine	Registered midwife: s norris
02 May 2012	Anaesthetic review required: wants an epidural	Midwife: s norris
04 May 2012	Strong family history thrombophilia: mother had CVA at 46 years	AJVC GP: Dr Generalpractice

Visits

BP Seated	Gest. Wks (Calc)	Fundal Height (cm)	Presentation	FHR	Descent	Fetal Movement	Liquor	Wt. (Kg)	Urine	Smoking Yes/No
26 Apr 2012	20.2 Wks	15 cm	Transverse	152	Not assessed	Normal movements reported	Not assessed		HAAD	Yes

User Notifications Search Results Patient Alerts

Message

There has been an error confirming your access to Kestral CIS. The availability and display of Pathology reports may be affected.

Messages

Ready.

60095 (Mrs Boyce, Carey)