

**An evaluation of the introduction of a Ward-based
Pharmacy Technician in children's medication
administration on two wards.**

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FINAL REPORT

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Executive Summary

Reducing medication errors is one of the priorities of NHS hospitals. The introduction of pharmacy technicians for nurse led drug administration to patients is increasingly viewed as a suitable mechanism to improve medication reporting and reduce medication errors in the long term. There are no studies at present which investigate the use and effect of pharmacy technician supported medication administration within a children's hospital in the UK.

Our study evaluated the implementation of a pharmacy technician supported medication administration system at Alder Hey Children's NHS Foundation Trust. The new system was introduced at two wards consecutively with one pharmacy technician.

The evaluation used mixed methods to ascertain whether the new system had an impact on the medication errors reported and medication errors occurring. It also explored the wider impact of the pharmacy technician working alongside nurses on the wards.

The analysis of medication errors logged on hospital systems revealed that no direct effect of the pharmacy technician could be observed on the reporting of medication errors or the reduction of errors during the implementation period. Additional analysis of the log book of the pharmacy technician however showed that there were clearly medication errors on both wards occurring. Our study then explored through qualitative interviews what the impact of a pharmacy technician supported medication administration system would be on the ward, including inter-professional working, quality and safety issues and nurses' awareness of them, as well as roles and competences. The study findings demonstrate that the impact of pharmacy technicians on the ward is considerable and that there is clearly potential for this impact to influence medication administration practices.

Our study findings support the view that a pharmacy technician supported medication administration system would have to be carefully calibrated to make a direct impact on medication errors and that future research needs to model in more detail the ways in which such an impact could occur and how it could be measured.

Future studies also need to establish the costs and benefits of pharmacy technician supported systems compared to the provision of additional nursing resource at ward level. Focussing on the inter-professional working, additional expertise and processes of shared knowledge and how this could be fostered in a pharmacy technician supported medication administration system is essential in producing evidence based knowledge for organisational changes in medication administration.

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Background

Alder Hey Children's NHS Foundation Trust is one of the largest children's hospitals in the United Kingdom [UK] and Europe. Located in the North West of England, each year the hospital provides care for over 270,000 children, young people, and their families. Alder Hey is a centre of excellence for heart, cancer, spinal, and brain disease; and is a designated Major Trauma Centre and national Children's Epilepsy Surgical Centre. The Trust is a leading paediatric research centre into children's medicines, infection, inflammation and oncology (Alder Hey Children's NHS Foundation Trust, 2017).

The pharmacy department at Alder Hey provides both inpatients and outpatients with medicines that are safe, appropriate, evidence-based and cost-effective. The treatment of children with medicines poses particular pharmaceutical and pharmacological challenges compared to adults. For example, infants are unable to swallow regular sized tablets, and neonates may require very small volumes of a parenteral medicine to avoid volume overload (Zajicek et al., 2013). Acceptability of and preference for dosage forms may also vary between children. The child's age, health status, behaviour, disabilities, background and culture must be taken into account (European Medicines Agency, 2013). Pharmacokinetic changes in childhood also have a significant effect on how a medicine is handled by a child's body; and need to be taken account of when deciding upon the appropriate dosing regimen (Choonara & Sammons, 2014).

Additionally, in the UK, unlicensed and off-label products account for 25% of medicines used for children in hospital general wards, 40% in paediatric intensive care units, and 80% in neonatal intensive care units (Nunn, 2003). Off-label use includes using a medicine: At a different dose; for a different indication; in a different age group; or by a different route to that recommended by the product licence (Choonara, 2004). Prescribing of unlicensed or off-label medicines in secondary care brings its own legal implications, and furthermore, can lead to problems obtaining the medicine and treatment disruption when the child returns to primary care (Tomlin et al., 2016).

The pharmacy team is comprised of pharmacists, pharmacy technicians and a wide range of support staff, experienced in the field of paediatric medicine and its associated challenges. The pharmacists and pharmacy technicians often work as part of the wider clinical team, supporting medical and nursing staff in providing treatments to patients, being responsible for ensuring that the correct medicines are prescribed and dispensed. Pharmacy technicians are a vital part of the pharmacy team, working under the supervision of a pharmacist. pharmacy technicians practicing in Great Britain are required to be registered with the General Pharmaceutical Council [GPhC], their professional regulatory body (GPhC, 2017). In order to register with the GPhC, pharmacy technicians must possess both appropriate competency and knowledge based qualifications, along with two years consecutive work-based experience (GPhC, 2013).

Qualified pharmacy technicians working in hospitals may be involved in areas of work such as manufacturing, aseptic dispensing, quality control, clinical trials, training and development, procurement, information technology, medicines information, and the supervision and management of staff. Pharmacy technicians may also be embedded in ward teams: Organising and rationalising medicines; reviewing prescription charts and ordering non-stock items; encouraging the transfer of dispensed medicines and patients' own drugs with patients who move wards; optimising medicines discharge to improve patient flow; and contacting ward pharmacists with drug information inquiries and when clarification with medical staff is required (Emergency Care Improvement Programme, 2015).

As hospital settings become increasingly pressured in the UK, nurse-led drug administration workloads are being alleviated by the introduction of pharmacy technicians to support busy wards and support the administration of medicines (Sinclair et al., 2016, Keers et al., 2017). A recent pilot study (Sinclair et al., 2016) on the introduction of pharmacy technicians onto an oncology ward as part of the nursing team, reported a reduction in adverse events, a reduction in nurse work-related stress associated with preparing complex medicines, and the freeing up of nurses' time.

An earlier study involving ward-based pharmacy assistants (support staff who are not registered with the GPhC but are involved in pharmacy services; GPhC, 2017), demonstrated that pharmacy assistant supported medication rounds significantly reduced the rate of omitted medication doses (Baqir et al., 2015). In contrast, an evaluation of pharmacy technician supported medication administration rounds on medical and surgical wards, demonstrated that pharmacy technician supported medicines administration may be both acceptable and potentially feasible to implement in NHS hospitals, but had no impact in reducing omitted doses (Keers et al., 2017).

Evaluation Aims and Objectives

The study evaluated the introduction of a 'Ward-based Pharmacy Technician' on two wards (one for patients with neurological or lifelong conditions and those on long-term ventilation – referred to in this report as "Ward 1"; the other a medical specialities ward – "Ward 2") in a Children's NHS Foundation Trust in the North West of England over a period of eight months between October 2016 and June 2017. It aimed to address the following research question:

What is the impact of the pilot of a pharmacy-technician supported medicine administration system (PTSMAS) on selected in-patient wards at Alder Hey?

To achieve this the evaluation undertook:

- 1) A data trawl and comparison exercise of medication errors six months prior to the service and six months after the introduction of the service in two wards
- 2) A qualitative study to explore the views and experiences of members of staff (pharmacy and nursing teams) involved in the PTSMAS.

The evaluation conducted a retrospective review of existing medication error data from two wards. We obtained and analysed data containing reported medication errors on the relevant wards, and conducted a comparative analysis of reported incidences before and after the implementation of a PTSMAS. The timeframe for the data trawl was set at six months prior and six months after the implementation of the new system.

The study was to include two pharmacy technicians who were to be placed on two different wards at the Trust. The wards differed insofar as one ward operated a near-patient pharmacy team (Ward 2), whereas the first ward did not. Near-patient pharmacy means that the ward has a fixed pharmacy on-site stocked with medicines and staffed with pharmacists and pharmacy technicians who work alongside nurses five days of the week for very specific tasks such as re-stocking. The task of the ward-based pharmacy technician in the new system to be implemented, differed from near-patient pharmacy technicians. The data analysis was to include four outcome measures: Medication errors on the wards; delayed medication notifications; adverse drug reactions; and, drug safety issues raised by staff.

The study protocol hypothesised that the new system would lead to improved, higher reporting of incidences in these four categories. The evaluation also conducted a qualitative study on the views and experiences of staff with the new medication administration system.

A ward-based pharmacy technician was appointed in August and underwent a month of in-house training, starting work on Ward 1 in September 2016. She moved from this ward to

Ward 2 on Monday 23rd January 2017 and continued to work there until Friday 2nd June 2017. Her post was then discontinued, and she took up a position elsewhere. The ward-based pharmacy technician met the educational and qualification requirements of the post and received additional training upon taking up the position on the first ward. As set out above pharmacy technicians generally hold a BTEC in Pharmacy Sciences (National Vocational Qualification [NVQ] Level 3 – 2 year course), a standard defined by the GPhC (2017). In our case, the pharmacy technician had also successfully completed an Accuracy Checker course (Health Education England, 2017). In addition, she received a Nurse Administration Competency Booklet and completed an Intravenous Therapy Training Course. She also completed Meditech 6 (electronic medical record system; Meditech, 2017) Training and Medicines Administration Record [MAR] chart Training. Moreover, she received training on the Ulysses Safeguard System (Ulysses, 2017), the Trust's Integrated Risk Management system, which enables all members of staff to, amongst other things, report incidents as they occur.

Changes to protocol

The initial data trawl from the existing medication error records revealed that there were few relevant data for analysis. Records from Ward 1 contained only six medication errors logged over a six months period before the implementation of the new medication administration system. This meant that data changes in medication error reporting post implementation of the pilot could not be reliably attributed to the new system.

The team then identified an alternative method of investigating the primary outcome measure of medication errors based on a qualitative research approach. They conducted a content analysis of the ward-based pharmacy technician's daily log, and subsequently quantified the data of logged incidences. Simple frequencies of incidences with different severities were calculated and are reported below.

Evaluation Methods

Evaluative research strives for an understanding of new or novel implementations, such as new roles and novel ways of working, their outcomes, and the impact of such changes in previously outlined settings (Fink, 2014). Qualitative data allows the research to elicit a "breadth of experiences to ensure certain 'voices' are not excluded, to provide a depth of insight, to help clarify why individuals' experiences vary and to ascertain the extent to which the origins of these variations can be affected by providers." (Chapman, Hadfield, & Chapman, 2015, p. 201).

The study used qualitative methodology in the form of face-to-face and telephone interviews with the ward-based pharmacy technician, their Colleagues, and two of the hospital's Strategic Leads analysed using Thematic Analysis; and a Content Analysis of the ward-based

pharmacy technician's medication error log across the two wards. Content Analysis and Thematic Analysis are reported to be complementary methods for qualitative studies (Crowe, Inder, & Porter, 2015; Schwappach, & Gehring, 2014; Vaismoradi, Turunen, & Bondas, 2013).

To ensure rigour in the qualitative interviews, the team used two techniques, the first "fair dealing" which ensured we incorporated a wide range of perspectives from the hospital setting (Mays & Pope, 2000, p.51). This enabled our findings to be representative of the large number of different professional and strategic standpoints, which exist within the organisation. Secondly, two researchers worked independently of each other whilst coding transcripts and then came together to check the inter-rater reliability and assumed a "negotiated agreement" system (Campbell, Quincy, Osseman, & Pedersen, 2013, p. 305). This is where some of the themes had been presented differently, although there was an excellent agreement on codes and subsequent quotations to support the claims made by each researcher (Armstrong, Gosling, Weinman, & Martheau, 1997).

For the content analysis of the ward-based pharmacy technician's medication error log, we followed Hsieh and Shannon's (2005, p. 1283) guidelines for "summative content analysis" whereby we quantified the qualitative data provided to understand which errors were being made and their frequency. Each error was then scored for severity using the National Coordinating Council for Medication Error Reporting Prevention [NCC MERP] Index for Categorizing Medication Errors Algorithm (based on Hartwig, Denger, & Schneider, 1991).

Recruitment

For semi-structured interviews a purposive sampling strategy was employed. Potential participants were identified and sent an e-mail inviting them to take part in a telephone interview. The ward-based pharmacy technician and the two strategic leads for pharmacy and nursing were interviewed face-to-face. All other interviews were conducted via telephone. In total, 14 interviews were carried out. A list of respondents is below:

- The ward-based Pharmacy Technician (once after each ward)
- The Director of Nursing
- One Ward Manager
- One Sister
- Four Staff Nurses
- The Chief Pharmacist
- Three Pharmacists
- One Near-Patient Pharmacy Technician

Interviews

Interviews were conducted with a semi-structured interview schedule, and conversational in nature. The schedule was devised to capture salient points relevant to the implementation of PTSMAS and it included questions about each participant's understanding of the role of a ward-based pharmacy technician, how PTSMAS had changed the ward, and how their role interacted with the new appointment. Informed consent was obtained verbally prior to interviews, and in writing for those who had face-to-face interviews.

All interviews were digitally recorded and transcribed verbatim. Interviews for colleagues averaged 20 minutes, whilst for the ward-based pharmacy technician and strategic leads interviews ranged between 30 minutes to one hour.

Our recruitment strategy ensured that participants with different professional backgrounds were interviewed, representing a wide range of perspectives meeting requirements for substantial data triangulation (Denzin, 2017).

Data Analysis

After interviews were transcribed and anonymised, the transcripts were subjected to a rigorous Thematic Analysis (Braun & Clarke, 2006) by two researchers (SAS and AK) coding independently of each other (Polit & Beck, 2010). Coding instances were then discussed and key themes were produced upon consensus between the two researchers. Thematic Analysis is often used as an analytical tool in healthcare research offering those working in clinical settings a critical review of the implementation within a setting (Chapman, Hadfield, & Chapman, 2015; Pope, Ziebland, & Mays, 2000). Braun and Clarke's Thematic Analysis process involved each researcher (re)familiarizing themselves with the transcript data, generating initial codes, and searching for potential themes emerging from the data. Themes were written up narratively below. They are evidenced through verbatim quotes.

Two researchers (LCC and SAS) undertook the content analysis, with a third researcher (AK) arbitrating over any discrepancies between the two sets of coding for the ward-based pharmacy technician's medication error logs from the two wards. The process consisted of interpreting the data and formulating key categories of incidences (Vaismoradi, Jones, Turunen, & Snelgrove, 2016). Six categories were formulated from the content analysis: 'Supply'; 'Storage Issues'; 'Communication & Linking-up'; 'Expiry Date Issue'; 'Medication Administration/Dosing Issues'; and 'Information – where ward-based pharmacy technician was the Source'. Each medication error was then scored using the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) algorithm on severity (adapted by the NCC MERP, from Hartwig, Denger, & Schneider, 1991).

Severity scores ranged from 'No Error' to 'Category D' where there was a subsequent intervention to preclude harm or extra monitoring was required. As before two researchers (LCC & SAS) scored independently of each other, coming together to reach a shared agreement, with any disagreements decided upon by a third researcher (AK).

Ethics and Governance

The study protocol was reviewed by the Faculty Research Ethics Committee at Edge Hill University and considered to be an evaluation not requiring full ethical review. A letter to this effect was obtained by the evaluation team. Alder Hey Hospital granted research governance approval in July 2016.

Results

Study findings will be reported in two sections below. The first section will contain the results of the analysis of the ward-based pharmacy technician's log; the second section reports the themes emerging from the analysis of the semi-structured interviews with staff.

Medication error log

As mentioned in the methodology section above, existing data sets obtained through Alder Hey from the reporting system Ulysses, did not contain sufficient numbers of reported incidences of medication errors to conduct a pre-post implementation comparative analysis to assess the effect of PTSMAS on medication errors.

The analysis of the ward-based pharmacy technician's logs, however, revealed a significant number of incidences at different levels of severity. The logs contained 152 recorded incidences on Ward 1 over a three months period, and 88 recorded incidences on Ward 2 over a subsequent three months period. Incidences in Ward 1 triggered 226 actions by the ward-based pharmacy technician, and 126 actions in Ward 2. The table below details the number of incidences in each category by ward. Table 1 sets out the actions taken per category that followed incidences. One incidence may have prompted multiple actions.

Table 1: Frequency of Type of Errors across Ward 1 and Ward 2

ACTION TAKEN	Ward 1 (152 Recorded Incidents; 226 Actions Taken)	Ward 2 (88 Recorded Incidents; 126 Actions Taken)
Supply	58	23
Storage Issues	15	14
Communication & Linking Up	43	19
Medication Administration/Dosing Issues	30	25
Information (where Ward-based Pharmacy Technician was the Source)	25	6
Expiry Date/Issue	55	39

Table 2: Frequency of Error Severity across Ward 1 and Ward 2

SEVERITY	Ward 1	Ward 2
<i>No Patient Involvement (i.e. action which was recorded, but not in relation to any patient so could not use algorithm)</i>	28	15
No error actually occurred (A)	17	0
Error, but did not reach Patient (B)	81	64
Patient was not harmed and no intervention required (C)	14	8
Patient not harmed, but intervention or extra monitoring required (D)	2	1
Error led to Temporary Harm of Patient, but did not require further hospitalization (E)	0	0
Error led to Temporary Harm of Patient, and required further hospitalization (F)	0	0
Error led to Permanent Harm of Patient (G)	0	0
Error did not lead to Permanent Harm of Patient (H)	0	0
Error Led to Patient Death (I)	0	0

One of the key findings of this study is that, as the log revealed, there are significant numbers of incidences that were not reported by nurses as medication errors. The overall picture emerging is a considerable discrepancy between the numbers of medication errors reported by staff on both wards and a significant number of potential or possible medication errors identified by the ward-based pharmacy technician.

Results Semi-structured interviews

Data from semi-structured interviews revealed a series of emerging themes. Two broad categories of themes were identified, and the findings reported below. The first category contains themes relating to the role, job description and tasks of the ward-based pharmacy technician and other staff. The second category contains themes about the impact and effect of the ward-based pharmacy technician on the wards.

Role, tasks and job description

A strong theme that reverberated throughout many interviews was the direct positive effect of the pharmacy technician's work on time management of nurses on the wards. There was a broad consensus amongst interviewees that the pharmacy technician allowed nurses on the ward to be released for other duties, which in turn led to an improvement in nursing care and

increased contact time of nurses with patients. This effect was particularly strong during the morning round of medication administration.

So, it was very difficult of a morning, because two Nurses used to try and start the oral medicines, while one went off to prepare the IVs. And then we'd have to wait until the end of the medicine round for somebody to come and to check through a multitude of IVs, and a lot of them are controlled drugs. So, when [name 1] came immediately she was able to do oral drugs with one Nurse while two Nurses did all those IVs and that.
(Ward manager)

There was also a consensus amongst staff interviewees that the presence of the pharmacy technician led to positive changes in the nursing and pharmacist routines on the ward. In particular, it allowed nursing staff to free up some of their time to attend to patients.

... she has allowed us to be a bit more free of time to focus on drug levels and things like that by doing some accuracy checking, which has helped us out a little bit more.
(Pharmacist 3)

I think the role does bring something different and I think it does release time to care.
(Strategic Lead for Nursing)

It frees up their care contact time. Yes, there's still a Nurse involved in medicines administration, of course, but there's one Nurse involved, not two. So it is freeing up nursing time to care which is what's important. (Strategic Lead for Nursing)

There was also a widely shared recognition that the job description and anticipated role of the pharmacy technician were well adjusted to other staff roles and tasks on the ward, in particular where near patient pharmacy was operating on the ward. This is significant as the pharmacy technician's role could have duplicated some of the tasks carried out by the pharmacy staff on the ward. That this was not the case demonstrated that there was particular benefit in developing a complementary position on the ward even where a patient near pharmacy was in place.

Well, the difference being that, our Pharmacy Technician who does the stock is just looking in our cabinet and is maybe not always making the link between what we using a lot of and what patients have got on. (Ward manager)

Staff interviews also revealed a clear acknowledgement of the positive effects of the wider role of pharmacy technician on the ward, with activities that went beyond supporting medication administration. There was a sense that these additional activities such as patient

medication counselling contributed to a positive perception of pharmacy staff and, for staff, a wider understanding of the role of the ward-based pharmacy technicians in the first place.

I don't think ward-based technicians should be hampered down too much with the dispensing role. I feel that they should be doing a better drug history, full-rounded medicines management, and in my opinion that involves speaking to patients, and their parents in our case, about when to take medication at home, how to take it, actually giving each family a full counselling experience, and I think that the great opportunity to do that is actually via giving the child the medication, 'cause it allows pharmacy that inlet into them and it explains a little bit more of our role to the family as well, so they can understand what we're doing and why, type of thing. (Pharmacist 3)

This echoed a similar indication about a shift in the perception of the role of the ward-based pharmacy technician by colleagues.

I think it is good to be able to expand our knowledge because I think we've become a bit stuck at the moment once we've qualified. We've kind of just stuck in a rut doing the same job whereas I think [Pharmacy Technician]'s job, the job that was [Pharmacy Technician] was doing or trialling out, it seemed like it was good, looked like there'd be good opportunities to expand your knowledge and working along other professionals. (Near Patient Pharmacy Technician)

This shift in roles and responsibilities resonated with pharmacy staff and reflected a perceived need to redefine and expand the scope of the role of ward-based pharmacy technician where appropriate.

We've always been a bit more cautious, I've always felt, in pharmacy. You've got opportunities to interact with parents, and I think we should take them. (Pharmacist 3)

...our technicians have a lot of information which they don't get to utilise because they're bogged down with doing re-supply, dispensing, which isn't, in my opinion, a hospital technician's role. They should be out, meds and doing meds management so that we can get patients converted over from liquids to tablets so that we can explain to parents why the drug isn't branded any more. (Pharmacist 3)

There has also been a clear recognition of the skills and knowledge that the ward-based pharmacy technician brought to the ward and an increased awareness of the need to utilise this expertise to improve the quality of patient care. Where staff felt that the ward-based

pharmacy technician was able to share this knowledge with nursing staff, elements of shared learning and, ultimately, increased confidence of staff, were mentioned.

She was more clued [up] in that aspect and it helped my role in that she would alert me to think they might not have been right, so I could prioritise myself better, so it give me a bit more confidence to know that she was also checking and I was aware of that due to her role... (Pharmacist 2)

An important part of any organisational change is to ensure that staff feel comfortable with changes to their routines and do not feel threatened by new staff. The interviews with staff revealed few instances where staff felt hesitant or apprehensive about the changes that were implemented through PTSMAS. However, the interviews were conducted at a time when staff had already had a chance to assess the benefit of the changes to their own working patterns and to the ward as a whole. The data from the interviews with nursing colleagues may therefore not give a complete picture of apprehension or anxiety about system changes that may well have existed at the early days of the pilot.

Some comments of some staff and the ward-based pharmacy technician herself, however, indicated that there may have been some reservations by staff before the ward-based pharmacy technician started her work. These reservations quickly evaporated as far as the data tells but it appears an important part of the pilot findings to note that the introduction of the PTSMAS was seen to entail significant changes to work patterns and routines by nursing staff and those changes may have been greeted by some levels of apprehension or concern.

...why aren't you freeing up one to do IVs and let [name 1] check them. And they were like, oh no, it's all right, we'll do them. And I think they were unsure as to what [name1]'s role was going to be. But once they've realised you know and I said no, no, [name 1] can check everything, let her do that. And I mean, as I say, staff have been like, don't let [name 1] have annual leave sort of thing they wanted her everyday. And I think you know, I think we'll all miss her when she goes, you know, because it's become the norm to accept that [name 1] is in there, doing that role for us so we can do something else. So you know even at weekends now, you know, as I say, you notice the difference when [name 1]'s not around, because it's back to the old system of what we used to do. (Ward Manager)

In particular, staff concerns about the introduction of the new system may revolve around grading, remuneration reflecting clinical expertise and job definition and encroachment on task sets, leading to loss of status and/or narrowing of the range of tasks. As far as we can observe in the data, none of these reservations and concerns proved enduring or deep-seated.

...on the ward that I was working, that I work on, there was some - not resistance, what word do I want to use - hesitance about what would I do, how would I fit in, would I be taking a Nurse's place - but I can't do everything that a Nurse can, am I going to be useful, am I not - and some staff were open - Yeah, extra person, let's help - some were, Oh, don't know, not so sure. But by being there, explaining the role, and actually doing the role with them, all the nursing staff had a complete turnaround (Ward-based Pharmacy Technician – Interview 1)

I think the resistance was basically - Is she going to take a job from us? Well, why would we have her - 'cause they were very interested - Well, what band are you, what have you done. 'Cause the equivalent, potentially - I'm a band five, and the staff Nurse is a band five, so if they were - it may be that, Well, you're getting paid the same as me, but you can't do all what I do type thing - well, Or are you going to take our job from us? Are you going to de-skill us? That was never going to happen here... (Ward-based Pharmacy Technician – Interview 1)

One important aspect of inter-professional work on wards is shared learning and mutual support utilising different skills sets and knowledge. The staff interviews revealed a strong sense amongst staff in the pilot that working alongside the ward-based pharmacy technician led to an increased awareness of dosing, side effects of medication and storage requirements. This reflects an important side of the placement of PTSMAS where knowledge is shared between different staff groups and professionals leading to a reduction of incidences on the ward and, ultimately, improved patient care.

She was also—'cause she's got the pharmacy knowledge as well, you know, her knowledge of some of the medications was a lot better than ours as well. (Sister)

I would, you know, ask her sometimes about medications if I wasn't sure about something, and she could then find out for me if she wasn't sure, which again saved time. (Sister)

...just simple things like how do I order this on Meditech - Well, I can show you that 'cause I know how to do that, rather than ringing various people, trying to do it over the phone, 'cause normally they'd ring the dispensary, they'd have to describe the procedure over the phone which, if you can't see it in front of you it's quite hard... (Ward-based Pharmacy Technician – Interview 1)

So she was explaining to me the expense of how much it actually costs obviously to make the meds and stuff, especially the fridge items. So I think, myself, I'm more conscious of making sure the meds are back in the fridge, because obviously I don't want that money to be wasted, 'cause I've now got an understanding of how expensive some of them actually are. (Learning Disabilities Nurse)

Impact and effect

The analysis of semi-structured interviews revealed strong messages around the positive impact and facilitating effect of the work of the ward-based pharmacy technician for nursing staff. The positive effects of her work could be seen in medication management during medication administration rounds and safety related issues such as medication errors, dosage, and expired pharmaceutical products.

The first noticeable effect of the ward-based pharmacy technician on the ward was in the timely administration of medication. This occurred mainly during the morning shift where most interviewees commented on a significant freeing up of time for one nurse, whilst the ward-based pharmacy technician would prepare and second check patient medications.

I just think it took—it was a massive load off, like, sort of pressure-wise. 'Cause the way we used to do it, I mean, obviously we were three separate wards then, but the way my old ward used to do it would be we'd—two people would stand at the drugs trolley, and they would do all of the medications, which meant really, for that hour in a morning, you weren't able to sort of go and do anything else for your patients or check your patients. (Staff Nurse 2)

She would prepare, like, get medications out in advance for you to then come and do them. So that would save you time 'cause she'd be preparing it in advance for you. (Sister)

Medications I think were given on time more regular. (Pharmacist 2)

The big difference, I think, was around supply of medicines, because - 'cause they don't have a service in the morning, if they needed anything for a morning dose before the Pharmacist came up at half past two, it'll be a case of they would need to either ring dispensary, tell them that it needed ordering... (Ward-based Pharmacy Technician – Interview 1)

It appeared that there was a noticeable improvement in the timely administration of medication to patients whilst the ward-based pharmacy technician was working on the ward.

Well, she was due meds at one o'clock and she's not had them yet. So the healthcare is like, Well, there's only one Nurse, and she's busy, or We can't get another Nurse to come and check them, and they'd have to explain that, whereas they could just - they

go, Oh, [P]'s done meds now, 'cause she's here, you know, 'cause I turn up to do the meds as opposed to them having to remind the Nurse so the Nurse then has to find someone else (Ward-based Pharmacy Technician – Interview 1)

...the children would be due medicine say for example eight o'clock and ten o'clock, everyone at the same time but you could be waiting over half an hour to get another staff Nurse from another bay to come and check your medicine and because the layout of the ward, all the wards are similar now in [hospital], there are three different zones and you're meant to stay within your zone obviously with the children you're looking after. Sometimes you can be waiting up to half an hour for somebody to come from another zone and then obviously there's a knock on effect because all your medications are late and then the parents obviously aren't happy... (Staff Nurse 1)

In general, staff also commented that her work led to considerable relief of work pressures during the morning shift.

So it certainly eased the pressure at those times. And then when D is here, it was a lot easier, and now we're back to, you know, not having somebody here, so it's got busy again. (Sister)

Obviously when D was there, that sort of took the pressure off, because it left you— unless you were checking them for your patients, it left you able to do other things, if that makes sense. (Staff Nurse 2)

It was very, very helpful at, like, particular peak times like eight o'clock in the morning, in particular, and the early, you know, that morning time, and again at lunch time. (Sister)

...it was really, they were given, it was a lot quicker, there was extra help we'd got it and then the Nurses who were, other Nurses were like able to do the emergency checks first thing in the morning so that Nurses were free to do emergency checks, and other things to do with the patients... (Band 5 Children's Nurse)

...when D started, the medication rounds were getting done so much quicker, so inevitably it was helping support the Nurses to be able to get on with our jobs a lot quicker. (Learning Disabilities Nurse)

There was also a noticeable improvement in medication errors identified and rectified at various points of incidence. One interviewee commented on increased medication incidences, even though this was not reflected in the list of medication errors logged by nursing staff in Ulysses.

I'm a medication safety Pharmacist [and] I did see an increase in medication incidents come from the ward because she was able, from her background I think she had a medicine governance background anyway so she did report, it brought attention to me or instances that were happening on other wards that maybe not normally got reported (Pharmacist 2)

I think there has been an improvement in meds safety and I've not necessarily seen a reduction in medication error, but then they weren't particularly high on that one on the ward, or at least not reported high (Strategic Lead for Nursing)

Parallel to this, respondents noted that the ward-based pharmacy technician gave useful advice to staff on dosage, which would relate to shared learning processes and complementary competences. Key anticipated impacts of the new system.

...she's also been very good at giving advice to the nursing team about medication and what medication to give together, and understanding of doses as well, and querying doses. (Pharmacist 3)

Some respondents also commented that the impact of the ward-based pharmacy technician was felt beyond the immediate ward staff and included patients. This may have had a positive effect on the way pharmacy staff were perceived by patients in addition to potentially improving patient care.

I think it was good as well for parents to see that it was a Nurse and somebody sort of representing pharmacy tech in the medications, 'cause that's two different sort of skill sets coming together. (Staff Nurse 2)

She's very good at being able to do that and actually to speak to the parents and patients about medication as well. I know of several occasions where she's had conversations with parents that have led to us going in and doing further counselling, so I think that part of her role has been really great. (Pharmacist 3)

There was some evidence that the introduction of the ward-based pharmacy technician changed the organisational set up of the ward, the way in which different professions worked together to address patient needs, as well as a recognition of improved overall performance by all. Her work was felt to impact positively on inter-staff communication, staff-patient communication as well as bridging between different professional groups.

I think her role actually allows better communication. I think we do - we're very lucky here at A [hospital], we do have good relationships between the pharmacy team and the nursing and clinical teams because we are ward-based rather than being segregated in a pharmacy department, so we are all based upon the ward - but she actually improved that even further by being there on the drug rounds. (Pharmacist 3)

I think actually she was providing, and continues to provide, a bit more of an in-depth look into what we're doing - a greater challenge because she's re-telling what the Nurses are discussing and not necessarily bringing to pharmacy's attention, so the Nurses might be questioning, Well, why haven't we rounded up a paracetamol to a more measurable amount? And it'd be something that we [in the pharmacy] could very easily overlook because it is the recommended dose, but by [technician] saying to us, Oh, can you, you know, get that changed - we would get it changed for them. (Pharmacist 3)

...it was nice to see that pharmacy was playing a role helping the Nurses, you could say like they did welcome her on the ward and she did look the part of a Nurse and helping them out yeah (Pharmacist 2)

...she played sort of a very integral role on sort of bridging the gap between the Nurses and our team. I think, primarily (Pharmacist 1)

Surprisingly, there were few comments on the impact of the ward-based pharmacy technician on the more cost-effective use of medications on the ward. Whilst noted by some, it appears that this issue may not be of primary importance to staff. Therefore, clearly, the measurable impact of the ward-based pharmacy technician on this issue as evidenced through the log (see section above), was not deemed as noteworthy as the inter-social and inter-professional effect of her role on the ward.

Only one nurse mentioned that conversations with the ward-based pharmacy technician alerted her to medication waste, and how to reduce it.

...that's definitely changed my practice in trying to be more cost-effective, because obviously now I know how much everything costs (Learning Disabilities Nurse)

As I say, I learnt a lot from her and, you know, 'cause if there was ever meds I'd left out, she'd say, you know, "D'you know how much this costs to make?" And if anyone poured too much, or it wasn't done a certain way, she'd go, "D'you know how much this actually costs?" And that was constantly reinforced when she was there, and it just made me realise, and I thought, yeah, d'you know what? Actually, I don't think I do give it much credit as to how much things cost. And it made me more mindful of

waste and stuff like that, so it definitely made me more mindful of my practices and how I am. (Learning Disabilities Nurse)

Finally, it should be noted that some staff felt that the pharmacy technician role should be carefully calibrated with existing resources on the ward, to ensure that all this additional resource is effectively used throughout the day, and not just at peak times.

So the one criticism I did have of the role is I think it could be looked into more in it being a little more efficient.... There would be times where [Pharmacy Technician] obviously would be occupying her time, but then she wouldn't be doing very much; but that was primarily because there was a Pharmacy Technician there with myself taking primary ownership of most of the other side of the pharmacy-based service. So [Pharmacy Technician] sort of didn't want to get involved with that, because there was a Pharmacy Technician that was going to be doing that later on in that afternoon.... I think in terms of rolling out into other trusts, I think that sort of model could work very well, but, like I said, I think it needs to be looked at in terms of making it more efficient. (Pharmacist 1)

But it has to be looked at and tailored towards different wards, and every single ward is different obviously. With the ward that she was working on with me is sort of a long-stay/rehab sort of ward where patients are on long-term medications at sort of set times, but it's for example, you're in a more of a surgical ward where drugs are given sort of ad-hoc and sort of they're when needed; medication administration times could be any time, so that might sort of change the workings. So I think, in general, I think it needs to be looked at sort of what type of ward she's working on, and that should be tailored around what times medications are generally given, 'cause that's when she's needed for that part of the role. (Pharmacist 1)

Discussion

The study hypothesised that the introduction of a pharmacy technician supported medication administration system (PTSMAS) would increase the reporting of medication errors by staff and, ultimately, reduce medication errors in the long term. The analysis showed that there was no effect on medication errors or reduction of medication errors on the wards could be observed while PTSMAS was implemented. This indicates that either the design of the present study was inadequate to observe any effect, or alternatively, that the main impact of PTSMAS is to occur in softer outcomes. The analysis of our qualitative data clearly shows that there has been a considerable effect of the PTSMAS on staff in their daily routines. The data also shows that there exists a significant number of incidences that may or may not be of reportable status within the wards, and require attention by the pharmacy technician. This indicates that PTSMAS as a programme, has the potential to have a positive impact both on primary and secondary softer outcomes, but any evaluation of such a programme would require an appropriate design using sufficiently sensitive instruments to observe effects over time.

There is some research about medication error reporting by nurses in hospitals and the attitudes of staff to effective reporting (Flynn et al., 2012; Parry, Barriball and While, 2015; Björkstén et al., 2016; Hung et al., 2016). It appears that effective medication error reporting is hampered by wider issues of nurse perceptions of malpractice, accountability, proportioning of blame in work context with highly hierarchical structures between clinical staff. It may simply be the case that the introduction of PTSMAS is too aspirational to address these long-standing problems of medication error reporting.

In our study, it appears that the way in which PTSMAS was set up in our site, there existed several barriers to the ward-based pharmacy technician having an impact on the reporting patterns of medication errors. These barriers may be linked to professional status, perceptions of professional boundaries and different responsibilities as well as the way in which the reporting portal (Ulysses) operates practically. Several practical issues may also prevent the pharmacy technician from effectively influencing medication errors reporting. First, pharmacy technicians may not have access to Ulysses or be permitted to log incidences. If they did, this may be perceived as an encroachment of nursing responsibilities challenging established social and professional dynamics between pharmacy technicians and nurses on the ward.

Second, nurses may report incidences at a time of their convenience rather than at the time of occurrence. This means that reporting practices may fall outside of the pharmacy technicians view and hence difficult to influence effectively. Third, nurses may see medication errors as a key measure of accountability and of quality of care and may resist improvements in the reporting that are not initiated by themselves or perceive them as attempts to exercise control.

One or any of these issues may have contributed to the difficulty to observe any positive changes in the reporting of medication errors on the two PTSMAS wards. There is no data at present to support either the existence or non-existence of either of these prohibiting factors. Any future research should therefore utilise a mixed method design to investigate the various influencing factors in medication error reporting and model the potential contribution ward-based pharmacy technicians can make in this context.

The analysis of the qualitative data however showed that PTSMAS had a considerable impact on various other domains. The most promising is the release of nursing time during medication rounds in the morning. Our respondents pointed to this as one of the most important effects of PTSMAS implementation on their ward. It should be noted that it was unclear from our data whether this effect could only have been produced by a ward-based pharmacy technician or possibly equally by additional nursing staff. The main message in this context related to the availability of an additional resource which freed up nursing time to attend to other work. This does not preclude that the same effect could have been achieved through additional nursing staff.

There were however clear advantages of PTSMAS to nurses and other staff on the ward that were specific to the work of ward-based pharmacy technician. It is these advantages that require careful additional investigation to assess the effectiveness of PTSMAS in comparison to alternative systems of medication administration.

The most prominent theme emerging from our interviews was the positive impact of inter-professional working on the ward brought about by PTMAS. This inter-professional work clearly was seen to include instances of shared learning and knowledge exchange which may be seen as the prerequisites for the potential to influence medication error reporting in the long run. In this respect our study demonstrated the clear positive impact of PTSMAS and revealed the potential to effect wider changes in medication administration and, ultimately, medication error reduction.

Like any inter-professional working, introducing a new member of staff into a team with a different professional background and training may have produced some initial reservations and contributed to concerns amongst nurses and we have found some evidence for these early on in the programme; self-reported by the ward-based pharmacy technician. This indicates that any PTMAS implementation requires careful preparation, clarify and transparency of roles and responsibilities, and good leadership to make it work.

Our data also appears to suggest that the success of PTSMAS implementation depends to a high degree on the individual who joins the ward, as well existing circumstances and working conditions on wards at the time of implementation. The qualities and interpersonal skills of the ward-based pharmacy technician appear to play an important role in any PTSMAS to succeed.

Our study revealed the need to strengthen the rationale of PTSMAS as a medication support system as opposed to the provision of additional nursing time on the ward. Further evidence is needed to demonstrate that the secondary softer outcomes of PTSMAS cannot be achieved through the provision of equivalent additional nursing resource. This links to a related concern amongst some respondents that a full time placement of ward-based pharmacy technician on the ward may not be an efficient use of this resource, in particular on wards with a patient near pharmacy. It was noted that after the morning medication rounds, the ward-based pharmacy technician may have had some significant working time that was not effectively used.

It raises the question as to whether or not the role of a ward-based pharmacy technician in a PTSMAS could potentially be delivered by pharmacy technicians who are operating the near-patient pharmacy on some wards. Although in our case, the two roles were clearly demarcated and neatly complementary, it was commented that pharmacy technicians in the near patient pharmacy role could also potentially deliver PTSMAS equivalent work. It is therefore essential that the rationale for the PTSMAS specific role of pharmacy technicians is strengthened and justified in comparison to any other near-patient pharmacy technician role. Such a justification would have to address the issue of potentially significant surplus time within PTSMAS for the pharmacy technician outside the medication rounds. A careful calibration of work patterns and working time may address this.

A second issue relates to the specificity of context in our study. Standards of medication administrations are different in children's hospitals to adult hospitals due to pharmaceutical and pharmacological challenges experienced within paediatric medicine. In theory, this strengthens the case for pharmacy technician supported medication administration systems, as the knowledge and expertise of pharmacy technicians extend to dosage and our study clearly demonstrated that staff on wards appreciated and recognised the considerable positive impact of PTSMAS on dosage practices. It appears thus important to gauge how important this effect is in comparison to other effects. A better understanding of its relevance for the success of PTSMAS would produce some indication about the possible impact, or lack thereof, of PTSMAS within the adult sector and, ultimately, how much PTSMAS is contingent upon contextual factors.

Limitations of study

This was a single site, non-controlled, cross-sectional comparative study of a PTSMAS with one individual at a children's hospital Trust. Limitations of the study arise from the nature of this design. The use of a single site with one individual ward-based pharmacy technician produced findings that are valid within the specific context of a children's hospital with its special dosage requirements in medication administration. It also made the findings highly dependent on the characteristics of the particular wards with and without near-patient pharmacy, and of the individual placed on the wards and her training background and expertise. As no effect could be observed on the primary outcomes, it could be expected that contingent factors such as the specific circumstances and context of the present PTSMAS may have heavily influenced qualitative data.

The qualitative data comprised the ward-based pharmacy technician's log as well as data from semi-scheduled data. Whilst our analysis of interview data was robust as we followed common practice in qualitative data analysis with a second rater, the data in the ward-based pharmacy technician's log required content analysis and coding by two independent researchers. Following coding severity scores were applied to each incident according to NCC MERP guidelines. This interpretation relied on the adequacy and completeness of information provided in the log. Whilst there were usually abundant notes to allow analysis, the notes of the ward-based pharmacy technician represented the view of a singular member of staff and were not verified through consultation with nurses. This makes log notes a different type of data, with lower quality and no cross-verification compared to reported medication errors.

The allocation of severity categories to the logged incidences also represented within the study, may also introduce the possibility of bias. As the severity grading was done by two independent researchers external to the hospital, it may not mirror the grading used routinely by hospital staff in our study. Although clearly defined by national guidelines, what constitutes medication errors, and at which level of severity is still likely to contain an element of contingent practice, and may be context dependent. This is demonstrated by the fact that none of the incidences logged in the ward-based pharmacy technician's notes were reported and captured by ward nurses through the medication error system Ulysses.

Future research

Our study demonstrated the importance of a mixed methods approach. Existing research indicates that there may not be an observable impact of PTSMAS on medication errors in hospital wards (Keers et al., 2017). As discussed above, there may be various reasons for this. Our study clearly showed that the ward-based pharmacy technician identified a significant number of incidences on a range of severity. This highlights the need to investigate why the work of the ward-based pharmacy technician does not result directly in improved medication error reporting and, ultimately, in a reduction of medication errors. An immediate impact of the new system on primary outcomes is likely to be hampered by issues of inter-professional working, perceptions of professional status and boundaries, as well as notions of responsibility and accountability. Only research utilising qualitative approaches can explore these issues sufficiently and permit researchers to model the potential effects on PTSMAS on medication error reporting for future verification. Initial work should therefore focus on exploratory studies and modelling of possible cause and effect chains of PTSMAS impact on medication errors. No such models are currently available for testing.

Once modelling has been undertaken, evaluations of PTSMAS would likely require several implementation sites (wards) with sufficiently long term observation periods to countervail the influence of contingent factors such as sector specific circumstances (children vs. adult hospitals), the role of local leadership and individual characteristics of wards and pharmacy technicians. Future PTSMAS should also carefully align the position of pharmacy technician with existing near-patient pharmacies on wards, as well as arrive at a clear justification for the knowledge and expertise of a ward-based pharmacy technician, as opposed to the provision of additional nursing resources on wards. A clear rationale for ward-based pharmacy technicians supporting medication administration needs to be widened to incorporate the positive effects of inter-professional working. This would also require a more in depth understanding of how to structure shared learning, and the exchange of expertise between pharmacy technicians and nurses. As this may turn out to be the main observable impact of any PTSMAS, it appears important that any future PTSMAS maximises the opportunities and effectiveness of shared learning on the ward through a more structured approach.

Since the softer outcomes of PTSMAS may materialise only over the longer term, any future research should utilise a longitudinal study design. A comparative study including various different work patterns of pharmacy technicians may also help in ascertaining the cost-effectiveness of the possible models of providing pharmacy technician expertise on the wards. In particular, potential overlap with near-patient pharmacy could be explored and compared to a full time position of ward-based pharmacy technician. A comparative study design could also accommodate the need to investigate the differential effect of PTSMAS in non-near patient pharmacy wards and near patient pharmacy wards.

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SUMMARY REPORT APRIL 2017

Evaluation of the introduction of a pharmacy-technician supported paediatric medicines administration system: Parent perspectives

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ABSTRACT

Background The preparation and administration of medicines to children carries a risk of error and subsequent harm. The process is complicated by the need to individualise drug doses according to the patient's age or weight as well as the requirement to prepare doses from products designed to be administered to adults. In many paediatric inpatient settings, in order to reduce the risk of error and subsequent harm there is a requirement for all or some medication preparation and administration processes to be carried out by one registered nurse and checked by another registered nurse. At our centre, a change to practice was implemented in which one of the nurses involved in the dual-checking process was released to undertake other duties and a pharmacy technician undertook the second checks. We undertook a service evaluation of this change.

Methods Families were recruited from two wards at Alder Hey Children's NHS Foundation Trust. Data were collected, from clinical records, for each patient whose parent was interviewed. Parent views and experiences of the contribution of the pharmacy technician were gathered via semi-structured interviews. An exploratory approach to analysis was taken using thematic analysis.

Results Twelve families were recruited. Parents spoke about the importance of communication about their child's medicines in hospital. Some (but not all) parents were aware of the pharmacy technician's role as second checker. The majority of parents felt fine about the technician's role, some were very positive and none expressed any concerns. Parents recognised the benefits of the technician's background and expertise and their contribution to the ward team.

Conclusion Although further evaluation is required, our findings indicate that parental views support the future development of this service.

BACKGROUND

The preparation and administration of medicines to children carries a risk of error and subsequent harm. The process is complicated by the need to individualise drug doses according to the patient's age or weight as well as the requirement to prepare doses from products designed to be administered to adults. The incidence of errors in paediatric medication preparation and administration in hospital is between 11.7% and 89.9% (1). The use of off-label and unlicensed medicines and the manipulation of medicines for children contribute to the risk of errors and some errors cause harm (2-4). Interventions which contribute to a reduction in medication errors will reduce the risk of harm. In many paediatric inpatient settings, in order to reduce the risk of error and subsequent harm there is a requirement for all or some medication preparation and administration processes to be carried out by one registered nurse and checked by another. It should be noted however that there is limited evidence that this dual-checking process reduces the risk of errors (5, 6).

Changes to medication prescribing, preparation and administration processes should aim to reduce the risk of medication error (7). The impact of pharmacy support staff on these processes has been investigated in previous studies. In two studies on adult medical wards in the UK and Denmark, the contribution of technicians to prescription review, inclusive of the identification of prescribing errors (a type of medication error) was demonstrated (8, 9). A study of pharmacy assistant involvement in medication administration rounds was undertaken on an adult medical ward in the UK and demonstrated a significant reduction in unacceptable omitted doses (a type of medication error) (10). A recent study in which pharmacy technicians assisted in the preparation and administration of intravenous medicines on a paediatric oncology ward in the UK demonstrated a reduction in adverse events, a reduction in work-related stress associated with preparing complex medication amongst nursing staff and an increase in nursing time available for patient care (11).

At our centre, a change to practice was implemented in which one of the nurses involved in the dual-checking process was replaced by a pharmacy technician. Having undertaken additional in-house training, the pharmacy technician undertook, in accordance with the principles of the Alder Hey Medicines Management Code, the following roles relating to medicines administration (which would have been previously undertaken by a nurse):

1. Attended medicines administration rounds on the ward
2. Checked the accuracy and appropriateness of the prescription
3. Checked the preparation and administration of prescribed medicines

4. Independently undertook calculations required during the medicines administration process and cross-checked them with those of the other practitioner
5. Recorded the administration of the medicine

We undertook a service evaluation of parent perspectives on this change to practice. To our knowledge, there are no previous studies which explore these perspectives in this context. Understanding what families think about the service will complement the findings of a separate, but related, staff-orientated impact evaluation and will inform the future development of the service.

AIMS AND OBJECTIVES

Aim

1. To explore the views and experiences of parents of patients involved in the pharmacy technician supported paediatric medicines administration system
2. To determine what is important to families in the context of in-hospital medication administration

Objectives

1. Undertake semi-structured interviews with the parents of patients who have been administered medicines whilst the pharmacy technician supported medicines administration system was in place.

METHODS

Design

A qualitative interview study

Setting

Families were recruited from two wards at Alder Hey Children's NHS Foundation Trust, a neuro-medical ward and a medical specialty ward (total inpatient beds = 56).

Inclusion Criteria

The study included the parents of children who:

1. were aged 0-15 years 11 months
2. were an inpatient for at least one day on a participating ward
3. were administered at least one medicine during their admission when pharmacy technician supported paediatric medicines administration was in place
4. had experience of being administered at least one medicine when nurse-only medicines administration was in place, either on current or previous admission (if it was the patient's

first admission to hospital they may still have had experience of the nurse-only system because this continued when the technician was not at work e.g. overnight or at weekends).

Exclusion Criteria

Parents of children who:

1. had not been administered at least one medicine during their admission when pharmacy technician supported paediatric medicines administration was in place
2. had not had experience of being administered at least one medicine when nurse-only medicines administration was in place, either on current or previous admission
3. the treating clinical team felt there was pronounced family distress or child protection intervention that would make it inappropriate to approach the family to take part in the study

Sampling & Recruitment

We aimed to approach all parents of children who met the inclusion criteria during their hospital stay to be asked if they would like to participate in this study. Potential participants were identified by the pharmacy technician, who provided them with a participant information sheet. Recruitment was undertaken by a member of the research team. Informed consent was obtained from parent participants. Where possible, assent was obtained from patients aged 8-15 years 11 months. Participants were free to withdraw from the study at any time. We aimed to recruit 12 parents (12).

Data collection

Patient Characteristics

The following data were collected from clinical records for each patient whose parent was interviewed:

1. Age
2. Reason for admission
3. Length of stay
4. Details of regular medicine(s) to include: name of medicine, route of administration, dose, frequency
5. Details of medicines administered on day of interview to include: name of medicine, route of administration, dose, frequency
6. Number of previous hospital admissions

Parent Interviews

Parent views and experiences of the contribution of the pharmacy technician were gathered via a semi-structured interview undertaken face-to-face in a quiet room on hospital premises. This was carried out by a member of the research team who had not been involved in the patient's clinical care. An interview prompt guide was used (see Appendix A) and interviews were audio recorded. Brief field notes (memo writing) were recorded by the interviewer immediately after the interview. Audio recordings were transcribed verbatim.

Analysis

Patient Characteristics

These data were summarised to provide a background to the findings of qualitative interviews.

Parent Interviews

An exploratory approach was taken using thematic analysis. Researchers JB and LB met to discuss emerging themes and develop analytical categories. Analysis was verified throughout by frequent review of transcripts to identify recurrent patterns and themes. A third researcher was used to reconcile differences in themes as and when they arose between the two analysts.

Ethics

Following advice from a NHS REC Manager (REC Reference: 16/NW/0605, IRAS Project ID: 212142) this study was deemed to be a service evaluation not requiring formal research ethics committee evaluation or HRA approval. It was registered with the clinical audit department at Alder Hey Children's NHS Foundation Trust.

RESULTS

Thirty one families were approached to participate in interviews, twelve (ten mothers and two fathers) were recruited. Interviews were undertaken over a 4 month period (November 2016 – March 2017).

Patient Characteristics

The characteristics of the children whose parents were interviewed are summarised in Table 1. Not all characteristics are reported here in order to reduce the likelihood that individual patients/families will be identified by readers.

Table 1 **Characteristics of children**

Patient ID	Age	Number of previous hospital admissions	Number of regular medicines prior to admission	Number of medicines administered on day of interview
PT001	12 years	0	0	3
PT002	4 years	0	0	11
PT003	12 years	0	0	2
PT007	5 years	> 10	12	12
PT011	2 weeks	0	2	3
PT016	6 years	>10	6	9
PT020	18 months	>10	3	3
PT021	1 month	0	0	4
PT023	14 years	5-10	8	4
PT027	2 years	1	1	11
PT028	15 years	1	2	16
PT029	9 years	0	21	17

Parent Interviews

During the analysis group meetings we discussed the coded interviews and agreed on the following broad themes: ‘medicines administration for children in hospital’ and ‘the role of the pharmacy technician in the ward team’.

Medicines administration for children in hospital

Understanding the process

Parents had different levels of understanding about the checking process for medicines in hospital, two parents were health care professionals and one had experience of working in a community pharmacy. Some were very clear about the process

‘.....checked on Meditech [electronic prescribing system] against her date of birth and her ID number and checked on the label of the bottle and the doses are double checked by a second person....’[PT002].

Others knew only a few details

'They ask about allergies'[PT023].

Important aspects of the process

They were concerned about the timing and accuracy of the medicines administration process.

'That they are accurate we've had overdoses in the past.....things like anti-epileptics and pain relief need to be on time' [PT002].

'.....more or less at the same time he has it at home because he's on regular medications' [PT016].

When medicines were administered late, this had a negative impact on the child's symptoms:

'the nurses are giving them at different times I would normally give which can have an effect on [child's name] because of the way it's in her system.....it just has a knock on effect on behaviour as well' [PT007].

'.....often the meds were a little bit late.....when he was symptomatic, especially with blood pressure it did have an impact on his blood pressure' [PT001].

A timely response to the child's symptoms was also important to parents:

'..... dose of paracetamol.....you just can't get it and you've got to wait' [PT007].

'so if I was to ask for some paracetamol that I kind of get it when I ask and there was no long wait'[PT020].

However, one parent recognised that some adaptation of their normal routine was to be expected whilst in hospital:

'.....I understand that they are not here to wait on [child's name] every 15 minutes. They have other people.....'[PT007].

Access to suitable or preferred formulations of medicines was mentioned by several parents:

'.....when she went from liquids to tablets some of the nurses didn't know, sometimes someone would come in with a liquid.....'[PT003].

'.....he got a little upset because one of the tablets wasn't the same to what he normally has' [PT016].

'....in the other hospital they wanted to give him a lot of things dissolved in water and he doesn't like it at all and it was a big struggle for him.....but he is taking all his medicines really well now'[PT027].

Ownership of the process

Some parents were also keen to take (or retain) ownership of their child's medicines while in hospital:

'and then I check as well.....they're late and I wish I could do it myself as I'm used to doing it myself.....you get quite frustrated and when your whole life is surrounded by her medicine routine and keeping that on track and on time.....'[PT007].

'I check everything.....I always check and ask what is it now and check the dose' [PT028].

Others expressed that they just trusted the health professional team: 'We think doctors know best, we just accept that.....' [PT027].

Communication

Several parents spoke about the importance of communication about their child's medicines in hospital.

'the main thing really is the timing, listening to parents of how their routine is'[PT007].

'communication is massively important and listening to patients, understanding and listening to parents.....taking into account what parents and children are telling them' [PT020].

'Communication is probably the first thing.....I'm his dad and I like to know what's going on.....it's not good if he's getting these medicines and no-one has told me it's coming up, it sets off alarm bells' [PT027].

Some parents described communication which did not meet their expectations:

'I have to keep telling them that it's supposed to be diluted.....I had to tell the nurses to stagger them' [PT023].

The role of the pharmacy technician in the ward team

Awareness of the role

Some parents were aware of the pharmacy technician's role as second checker:

'....we're right by the nurses' station, I've seen [technician's name] working with the nurses.....'[PT001]

'....I noticed her on the ward and then we discussed it afterwards.....she wore a different uniform a pharmacy uniform rather than a nurse's uniform' [PT002].

Others were not aware:

'I've got to admit I have seen her but no I wasn't aware' [PT020],

'No, I had no idea at all what was going on behind the scenes' [PT027].

Opinions about the role

The majority of parents felt fine about the technician's role, none expressed any concerns:

'well I think it's fine, I think it's a good idea'[PT001],

'no I think it's fine as long as somebody is checking it'[PT003].

Two expressed a desire to know more about the experience of the technician before being able to say how they felt about it:

'you know the technicians are they actually attached to this ward and will they be able to do everyone's medicines and stuff?' [PT020].

'....I need to know what kind of person she is, the pharmacy technician, what kind of experience she has.....'[PT028].

Impact of the role

Some parents were very positive about the role and gave further information to explain their outlook:

'....when we first came to this ward and it was just nurses checking the meds quite often the meds were a little bit late.....what I've noticed since [technician's name] has been helping out, is they've just been on time and sort of regularly' [PT001].

'The main thing I noticed firstly that the meds were on time a lot more you weren't constantly waiting.....'[PT002].

'....it has made a massive difference, a massive difference mainly because [child's name] gets his medicines on time [PT029].

Parents recognised the benefits of the technician's background and expertise:

'.....eye drops.....they expire pretty quickly....[technician's name] has been able to get them really, really quickly.....'[PT001].

'.....it's a good idea, that's what they're doing day in and day out, sorting out medicines and stuff....the knowledge that they've got would be as good as what the nurses have got in relation to all the medicines'[PT020].

'.....you know the pharmacy techs sometimes have a little bit more of an idea about how different things work together. So they would be able to query something maybe a little bit more readily than nurses who aren't medicine experts' [PT001].

'.....I think having two different disciplines coming together is great' [PT027].

Two parents also identified that the technician's role had a positive impact on nursing time:

'.....obviously it is pulling a nurse away from doing her other jobs.....this is their special job where a nurse has lots of different jobs, it could get too busy and confusing.....you know the nurses have got that extra pressure taken off them while it's a busy time going on'[PT007].

'It takes a lot of pressure off the nurses as well. In some pods [ward areas].....there's only one nurse so everybody is running around after each other looking for checks.....the main thing is that it takes a lot of pressure off the girls it takes a huge amount and the girls can concentrate also on what they need to do.....'[PT029].

DISCUSSION

Parents' main concerns about their children's medicines were that they were given on time and that they were given accurately. In addition, some parents described the importance of access to formulations that were acceptable to their child. Retaining some control of the medicines administration process was important to some parents specifically when parents were used to managing this process themselves at home. Parents valued good communication about their children's medicines, they wanted the ward team to listen to what they had to say about their child's normal medicine routine and they wanted to be told about changes.

Just as parents' understanding about the medicines administration process differed between individuals, there were different levels of awareness about the pharmacy technician's role as a second

checker on the ward. Those parents who were aware of this change to practice were positive about it, none expressed any objections. Specifically, some parents had noticed an improvement in the timely administration of medicines, something which was important to them. Parents also recognised that the pharmacy technician brought skills and expertise to the medicines administration process which complemented those of the nursing staff. Another observation was the positive impact of the pharmacy technician's role on the nursing team's time; the pharmacy technician was described as taking pressure off the nursing team.

The interviews described here were undertaken on two hospital wards by two researchers who are pharmacists. They were not involved in the clinical care of the children on the included wards, however it is conceivable that the setting of the interview and the professional background of the interviewers may have introduced bias. The findings are also limited to two paediatric ward settings and other themes may have emerged if the service evaluation had been extended to other wards or hospitals been included. However, resource limitations meant that a pragmatic approach was required to meet the aims of this service evaluation.

To our knowledge, no previous studies have evaluated the perspectives of parents in this context. A previous study has however highlighted how communication about medicine-related issues does not always meet parents' expectations (13) and another found that parents were keen to take ownership of the medicines administration process (14).

The findings of this service evaluation provide positive support for this change to practice. They will be reviewed alongside the other aspects of the evaluation in order to obtain an overall perspective on the impact and feasibility of this change. Future work should focus on confirming these findings in other settings, for example on other types of ward and at different centres. Consideration should be given to undertaking interviews with patients. In addition, efforts should be made to reduce the potential for bias, for example by conducting the interviews outside of the acute hospital setting.

CONCLUSION

Parents were positive about a change to practice which involved a pharmacy technician rather than a nurse acting as a second checker for medicines administered in hospital. In addition, some parents expressed a desire to be involved in the process. Parents did not express any negative opinions about the system. Although further evaluation is required, these findings indicate that parental views support and should inform the future development of this service.

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Evaluation of the introduction of a pharmacy-technician supported paediatric medicines administration system: Parent perspectives

Interview prompt guide

Patient Characteristics

Name

Age

Gender

Admission details

Reason for admission

Length of stay

Interview Questions

During this interview, when we say ‘medicines’, we mean oral medicines like tablets and liquids, rectal medicines like suppositories, injections, patches and creams. We are asking these questions to help us find out what our patients and parents know about how we give out medicines to patients who are staying in hospital. We don’t expect you to know all about it, we will explain the details as we go through the interview. We are interested your views on the process.

First we have some questions to find out what you already know about the process:

- 1. What do you know about what checks are carried out before [child’s name] medicines are given when they are in hospital?**
- 2. What you know about who checks [child’s name] medicines before you are given them when you are in hospital?**

The name and dose of the medicine are checked on the prescription. Then the medicine is prepared and this is checked (e.g. right number of tablets) and cross-checked with the prescription. Finally they check your identity and this is cross-checked with the prescription before the medicine is given to you. Medicines are checked by two members of staff, usually two nurses, but in our study one nurse and one pharmacy technician.

Next we have a question to find out what you think:

- 3. During your hospital stay, some or all of [child's name] medicines were checked by one nurse and one pharmacy technician (instead of two nurses).**
 - a. Were you aware of this?**
 - b. What do you think about this?**

Prompts: did you perceive a difference? anything good? anything bad? any concerns? any comments?

Finally, two questions about what is important to you, when it comes to [child's name] medicines:

- 4. When [child's name] is in hospital and they need to be given a medicine, what matters to you most?**
- 5. What do you think doctors, nurses, pharmacists and pharmacy technicians should focus on to make the process of administering medicines the best it can be?**

