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Forensic Nurse Examiners versus Doctors for the Forensic Examination of Rape and Sexual Assault Complainants: A Systematic Review

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Abstract

BACKGROUND

Within the UK, the complainants of rape and sexual assault are typically referred to regional sexual assault referral centres (SARCs) where their medical and psychological needs are addressed and, if they consent, a forensic medical examination will be conducted, usually by a forensic physician. In the USA, this service is typically nurse-led.

OBJECTIVES

To compare the reliability and efficacy of Sexual Assault Nurse Examiners (SANEs)/Forensic Nurse Examiners (FNEs) with that of non-SANE health professionals in the conduct of the forensic medical examination and the collection of forensic evidence (rape kit) from the complainants of rape and sexual assault. The following outcomes are used to quantify the efficacy of the SANEs: complainant quality of life, conviction and prosecution rates, complainant mortality within 30 days, time from complaint to examination, provision of STI, pregnancy and HIV prophylaxis, collection and documentation of rape kits and forensic examination, number of rape kits admissible as evidence, and the average cost per case.

SEARCH STRATEGY

The following databases were searched: *The Cochrane Library, MEDLINE, EMBASE, AMED, CINAHL, PsychInfo, BNI, Health Business Elite, HMIC, Social Policy and Practice, Google Scholar,* and the *Scientific Citation Index.* Relevant studies were selected by two independent reviewers and no restrictions were placed on either the year or language of publication.

SELECTION CRITERIA

This review included studies comparing outcomes for complainants of rape and/or sexual assault who were treated by a SANE, with those treated by a non-SANE health professional, irrespective of the study design and the age of the complainants.

DATA COLLECTION AND ANALYSIS

Two reviewers were involved in the data collection and analysis. Risk ratios (RR) or mean differences (MD) with 95% confidence intervals (95% CI) were calculated with both the random-effects and fixed-effects model using RevMan 5.1 software. Where differences were noted between the results, both models have been reported. Where no significant differences have been found, only the results from the random-effects model are reported (data from both models can be found in Appendix 1).

RESULTS

A total of eight studies were included in the systematic review, six of which were included in the meta-analysis. This provided an overall sample size of 2700 complainants; 1223 complainants were examined by a SANE (SANE group) and 1477 were examined by a non-SANE health professional (non-SANE group). No data were available on complainant quality of life. Two studies compared the conviction and prosecution rates, with no significant differences found (relative risk (RR) 1.00, 95% confidence interval (CI) 0.64 to 1.55 and RR 1.04, 95% CI 0.73 to 1.48 respectively). Significantly more rape kits in the SANE group were admissible as evidence in court (RR 1.20, 95% CI 1.06 to 1.35). No data were reported for 30-day mortality or time from complaint to examination.

In terms of clinical care, complainants in the SANE group were significantly more likely to have received STI and pregnancy prophylaxis than those in the non-SANE group (RR 1.07, 95% CI 1.01 to 1.13 and RR 1.32, 95% CI 1.19 to 1.46 respectively). No significant differences were found regarding the provision of HIV prophylaxis (RR 1.29, 95% CI 0.87 to 1.89). Using a fixed-effects model, complainants in the SANE group were significantly more likely both to have a forensic examination (rape kit) and to have it documented (RR 3.94, 95% CI 3.21 to 4.84 and RR 3.21, 95% CI 2.71 to 3.80 respectively). However, the results were not significant with a random-effects meta-analysis (RR 2.79, 95% CI 0.21 to 36.38 and RR 2.28, 95% CI 0.65 to 8.01).

In terms of cost, the SANEs were found, on average, to be £68 cheaper per case than their physician counterparts. Confidence interval data were not available for this outcome and it is not clear if this difference is significant.

AUTHORS' CONCLUSIONS

While there does not appear to be any benefit gained in terms of prosecution and conviction by substituting forensic doctors with forensic nurse examiners (FNEs),

the FNEs do seem to be statistically significantly better in the provision of clinical care and are able to provide a cheaper service than that led by physicians. However, due to the limited data available to this review, it should be borne in mind that the evidence base for these conclusions is very weak, and, without further research, should not necessarily be used to form the basis for any significant services changes.

1 Background

1.1 DESCRIPTION OF THE CONDITION

The Sexual Offences Act defines sexual assault as "*Intentional contact, of a sexual nature, with another person's body without their consent or knowledge*" (Home Office, 2003). More specifically, the act defines rape as "*Intentional penetration of the vagina, anus, or mouth with a penis, without consent.*" In 2010/11 there were a total of 54,982 sexual offences (including both rape and sexual assault) reported by the police in England and Wales (Chaplin, 2011). In addition to this, a further 17,727 sexual crimes were reported against children (National Society for the Prevention of Cruelty to Children, 2012). While the reported incidence of rape and sexual assault is already relatively high, it has been suggested that around 40% of adult and 31% of paediatric complainants of rape and sexual assault do not disclose their experience(s) to anyone (HM Government, 2007). As such, current reports of the incidence of rape and sexual assault may be well below the true figure.

It has been estimated that each rape costs £73,487 (Dubourg and et al., 2005), and the overall cost of sexual violence to society was estimated at £8.5 billion in 2003/04 alone (HM Government, 2007). When investigating the costs involved in such crime, it is worth noting that the figures quoted above only include the costs to society and not personal costs incurred by the complainants of sexual violence. It is also important to note that neither the long-term emotional, physical or psychological consequences of rape or sexual assault appear to have been considered in this costing exercise.

Current best practice in assisting and treating the complainants of rape and sexual assault within the UK is through the use of a Sexual Assault Referral Centre (SARC) (Home Office et al., 2005). The first of these centres was established in 1986 within St Mary's Hospital in Manchester (Home Office et al., 2005). The purpose of any SARC is to offer the complainants of rape and sexual assault the support of crisis workers, forensic examination, appropriate medical care, and psychological support throughout their experience of the medical, forensic and legal aspects of their experience. In addition to improving care of the complainants, this approach to rape and sexual assault is thought to offer an increased standard of forensic evidence collection and, subsequently, increases the potential for the conviction and prosecution of the perpetrators of sexual offences (Home Office et al., 2005).

There are currently 30 SARCs in operation across the UK, with a further 15 planned (Stern, 2010) and, in addition to improving care at the point of contact, they allow self-referring complainants access to a forensic examination, should this be their wish. Forensic examinations are typically carried out by female forensic physicians; however, there are three specialist nurses currently carrying out this role, with a further 20 in training (UKAFN, 2012a). Prior to the implementation of the SARCs, any complainant wishing to undergo forensic examination was required to report their assault to the police. Medical and forensic services were typically delivered through busy emergency departments, police stations and, in one case, a hospital mortuary, where care was administered by unspecialised doctors and nursing staff. The implementation of the SARCs meant that any complainant of rape could choose to undergo a forensic examination, without first contacting the police. The forensic evidence from such examinations is stored so that the complainant can, if they wish to, pursue prosecution at a later date.

1.2 DESCRIPTION OF THE INTERVENTION

Forensic Nurse Examiners (FNEs) are fully qualified nurses, who have been trained in the field of forensic evidence gathering, with particular respect to cases of rape and sexual assault in both adults and children (IAFN, 2006). Although there are only three FNEs currently working within the UK, the American/Canadian equivalent of these nurses, the Sexual Assault Nurse Examiners (SANEs), have been established since the late 1970s (Ledray and Simmelink, 1997). Like the SARCs in the UK, SANE programmes in the USA were established in response to issues surrounding the proper care of rape and sexual assault complainants and, more specifically problems surrounding the recruitment and retention of female forensic examiners to deal with these cases (Ledray and Simmelink, 1997, Kelly, 2004). The SANE is typically responsible for conducting forensic examinations, collecting and documenting findings, preparing statements for court when requested to by the police or Criminal Prosecution Service (CPS), and giving evidence in court, where necessary (Kelly, 2004). As noted above, there are currently very few FNEs employed within SARCs in the UK. Unlike their SANE counterparts, the FNEs do not currently attend court and their statements are checked and verified by a medical doctor prior to any case going to court (Inott, 2012).

1.3 HOW THE INTERVENTION MIGHT WORK

The intervention would work by substituting forensic doctors with FNEs as the lead in the forensic and clinical aspects of rape and sexual assault cases. One of the most obvious benefits of this would be a reduction of the costs involved, as retention of specialised forensic doctors is generally more expensive than that of nursing specialists (NHS Employers, 2012, Royal College of Nursing, 2012, Dubourg and et

al., 2005, Kelly, 2004). Additionally, nurses are able to spend more time with the complainants, show greater empathy, and are better able to foster a sense of control and empowerment in the complainants of sexual crimes (Campbell et al., 2008, Campbell et al., 2005). Further benefit would be the highly specialised nature of this role, which would allow these nurses to hone their skills and develop their expertise and, potentially, maximise their credibility and acceptability as expert witnesses in a court of law. Also, by employing specialist nurses, it is more likely that all SARCs will be in a position to allow the complainants of rape and sexual assault to choose the gender of their examiner, as required by current national guidelines (Department of Health et al., 2009).

1.4 WHY IT IS IMPORTANT TO DO THIS REVIEW

There are currently no systematic reviews examining the efficacy and reliability of forensic nurses against that of non-SANE health professionals in the care and treatment of the complainants of rape and sexual assault. As such, this review may prove useful in informing the organisation and commissioning of sexual assault services in the longer term.

2 Objectives

To compare the reliability and efficacy of Sexual Assault Nurse Examiners (SANEs)/Forensic Nurse Examiners (FNEs; henceforth referred to as SANEs) with that of non-SANE health professionals in the conduct of the forensic medical examination and collection of forensic evidence from complainants of rape and sexual assault. The following outcomes are used to quantify the efficacy of the SANEs: complainant quality of life, conviction and prosecution rates, complainant mortality within 30 days, time from complain to examination, provision of STI, pregnancy and HIV prophylaxis, collection and documentation of rape kits and forensic examination, number of rape kits admissible as evidence, and the average cost per case.

3 Methods

3.1 CRITERIA FOR CONSIDERING STUDIES IN THIS REVIEW

Types of studies:
Both experimental and quasi-experimental trial designs were eligible for inclusion in this review. Quasi-experimental designs were restricted to designs that included a control or comparator condition. No restrictions were placed on publication language, publication date or status, or the size of the sample included. Case-studies or case-series were not included as they do not offer the opportunity to compare the two different types of intervention being investigated here.

Types of participants:
All complainants of rape or sexual assault, regardless of their age or gender, or whether or not they reported the incident(s) to the police were considered eligible participants for this review. The intervention group comprised those complainants who had been examined and treated by a Sexual Assault Nurse Examiner (SANE); the control group comprised those who were examined and treated by a non-SANE health professional. Participants were included where data relating to at least one of the outcome measures was available.

Types of intervention:
Forensic medical examination of rape complainants which have been conducted by a SANE, who has been fully trained in the field of forensic evidence gathering, with particular respect to cases of rape and sexual assault in both adults and children.

Types of control:
Forensic medical examination of rape complainants which have been carried out by a non-SANE health professional.

Types of outcome measures:
Primary outcomes:

1. Complainants' quality of life.
2. Proportion of cases resulting in conviction.
3. Proportion of cases resulting in prosecution.
4. Complainant mortality within 30 days.

Secondary outcomes:

1. Time from complaint to examination.
2. Provision of sexually transmitted infection (STI), pregnancy and human immunodeficiency virus (HIV) prophylaxis.
3. Proportion of complainants who had a rape kit collected. This is a collection of evidence, which is used for prosecution purposes.
4. Proportion of complainants who had a forensic examination documented. This is where it has been documented that a forensic examination has been carried out, regardless of whether or not a rape kit has been collected.
5. Number of rape kits admissible as evidence.
6. Cost per case.

Evidential quality was assessed through the analysis of data collected for the proportion of complainants who had a rape kit collected, those who had a forensic examination documented and the number of rape kits which were considered admissible as evidence.

3.2 SEARCH METHODS FOR IDENTIFICATOIN OF STUDIES

Electronic searches:

The following databases were searched: *The Cochrane Library, MEDLINE, EMBASE, AMED, CINAHL, PsychInfo, BNI, Health Business Elite, HMIC, Social Policy and Practice, Google Scholar,* and the *Scientific Citation Index.* The search strategies can be found in Appendix 1.

Searching other resources:

The following professional organisations and bodies were contacted in order to identify any additional unpublished reports and data: Rape Crisis (an organisation which exists to promote the needs of women and girls, who have experienced sexual violence), all SARCs registered in the UK, UK Association of Forensic Nurses

UKAFN), the International Society of Forensic Nurses (IAFN), both the Canadian and American Society of Forensic Nurses, and the Worshipful Society of Apothecaries of London (an organisation offering training to health professionals and academic examination in the forensic and clinical aspects of sexual assault).

3.3 DATA COLLECTION AND ANALYSIS

Selection of studies:

Two reviewers worked independently to identify studies for inclusion in this review, and to list the reasons for studies which have been excluded. Any differences of opinion were resolved through discussion.

Data extraction and management:

In order to ensure accuracy and reduce the potential for bias within the review, data were extracted independently by two reviewers, using an Excel data extraction form. In the event that a full data set was not available, the individual study authors were contacted with the aim of obtaining this information. In addition to data for the outcomes detailed above, the following data were also extracted:

1. Year of publication.
2. Country.
3. Inclusion and exclusion criteria.
4. Details of the interventions.
5. Total sample size and the number of participants in each treatment group.
6. Gender and mean age of the participants.
7. Outcomes reported.
8. Bias risk assessment.

Any differences of opinion were resolved through discussion.

Assessment of risk of bias in included studies:

Bias can be referred to as prejudice or systematic error. If there is bias present within any of the included studies, this can lead to a misrepresentation of the truth and, consequently can lead to an over- or under-estimation of the true effect of the intervention under investigation. Risk of bias within the included studies was assessed in accordance with the guidelines set down by the Cochrane Collaboration (Higgins and Green, 2011). The following components were assessed:

1. Selection bias – this refers to systematic difference in group selection and, consequently, differences in the baseline characteristic between the two intervention groups.

2. Blinding of participants and personnel – also referred to as performance bias. This refers to systematic differences in the care provided to participants in the two intervention groups. Consequently, the two groups are exposed to different factors.
3. Blinding of outcome assessment – also known as detection bias. This refers to systematic differences in how the outcomes are determined.
4. Incomplete outcome data – typically known as attrition bias. This refers to systematic differences between the two intervention groups in terms of withdrawals from the study.
5. Selective reporting – this refers to systematic differences between reported and unreported findings. It can also be observed when the order of the outcomes is altered.
6. Vested-interest bias – this can be observed as study design, analysis, and presentation of results which is biased in favour of the funder and/or researcher.

These elements were individually classified as high, low, or unclear risk of bias, based on the information available from each individual study.

Measures of treatment effect:
For all of the binary outcomes, risk ratios (RR) were calculated, along with 95% confidence intervals (95% CI). None of the continuous outcomes were reported.

Unit of analysis issues:
The individual complainants of rape or sexual assault were treated as the units of analysis.

Dealing with missing data:
No data were missing for the outcomes reported by any of the included studies.

Assessment of heterogeneity:
Statistical heterogeneity was established through the use of the Chi-squared test. As the Chi-squared test is relatively low-powered, a P-value of 0.10 was used to indicate heterogeneity. The magnitude of any heterogeneity was quantified using Higgins I^2 (Higgins and Thompson, 2002). An I^2 below 40% was considered to be unimportant; 30% – 60% indicated moderate heterogeneity; 50% - 90% substantial heterogeneity; and an I^2 in excess of 75% indicated considerable heterogeneity (Higgins and Green, 2011).

Assessment of reporting biases:
Not enough studies were included within this analysis to allow the accurate detection of any reporting bias.

Data synthesis:
The meta-analysis was conducted using RevMan 5.1, using both a fixed-effects model (Demets, 1987) and a random-effects model (DerSimonian and Laird, 1986). When combining the data, the fixed-effect model assumes that each study is estimating exactly the same quantity, and produces the best estimate of the mean effect. However, the random-effects model makes no such assumption. With this approach it is assumed that that estimated intervention effects follow a distribution across studies. The result produced by the random-effects model is the average of the mean effects in different populations. Where no differences were found between the two models the results from the random-effects model have been reported (data from both models can be found in Appendix 1). Where there were discrepancies affecting the significance of the effect estimates, both models are reported. The Mantel-Haenszel method was used for the binary outcomes and the inverse variance method was used for the continuous outcomes.

Subgroup analysis and investigation of heterogeneity:
The following subgroup analyses were planned:

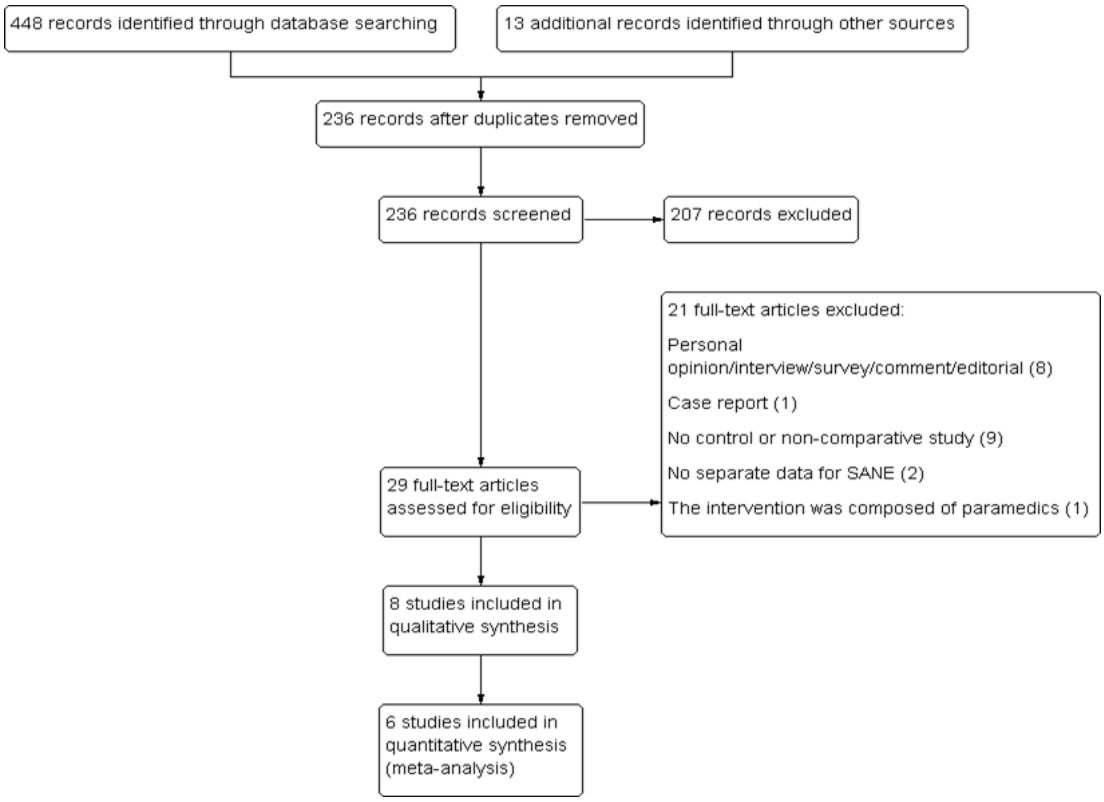
1. Medical doctors versus other emergency medical personnel as non-SANE health professionals in the control group.
2. UK versus USA programmes.
3. Paediatric versus adult cases.

However, there were too few studies to make these analyses possible. There were also too few studies to allow the conduct of sensitivity analyses to establish the cause of any observed heterogeneity. With regard to heterogeneity, it is worth noting that all data were included in the analyses, regardless of any variations in the provision of care between the studies.

4 Main Results

Although randomised controlled trials (RCTs) were eligible, none were identified. While this does leave this review prone to selection bias, it was considered acceptable to continue with quasi-experimental studies. A total of 461 references were identified through both the database searches outlined above (n = 448) and from other sources (n = 13). Duplicates and irrelevant papers accounted for 432 references, leaving 29 references for full assessment. No further studies were identified by searching the references of the 29 papers obtained for full assessment. In total, 21 papers were excluded. The reasons for this are outlined in appendix 3. Eight studies meeting inclusion criteria were included in the qualitative synthesis (Bechtel et al., 2008, Campbell et al., 2012, Campbell et al., 2012a, Crandall, 2003, Derhammer et al., 2000, Kelly, 2004, Ledray and Simmelink, 1997, Sievers et al., 2003); six of these studies were also included in the meta-analysis (quantitative synthesis) (Bechtel et al., 2008, Campbell et al., 2012a, Crandall, 2003, Derhammer et al., 2000, Kelly, 2004, Ledray and Simmelink, 1997). The remaining two studies were included only in the qualitative synthesis; one because it presented the same data as another paper (Campbell et al., 2012), and one because it did not report data for any of the outcomes investigated in this review (Sievers et al., 2003). The flow of references is outlined in figure 1.

Figure 1. Reference Flow



4.1 DESCRIPTION OF STUDIES

(see "characteristics of included studies" table)

In total 2700 complainants were included in this meta-analysis. Of this group, 1223 complainants were cared for by a Sexual Assault Nurse Examiner (SANE), and 1477 were cared for by a non-SANE health professional. Non-SANE healthcare professionals included both specially trained and general physicians. Services in the UK tend to rely in the former, while those in the USA have tended to utilise general physicians where there is no SANE service. One study focussed on paediatric complainants of sexual assault and included a sample of 114 complainants (Bechtel et al., 2008). Ninety-eight per cent of the complainants in this study were female and the mean age was 14 years. One study evaluated the service offered to adult complainants by SANEs in the UK (Kelly, 2004) and included a sample of 1072 complainants, of whom 992 were female. All four remaining studies evaluated services offered to adult complainants in the USA. The sample sizes were 293 complainants (Campbell et al., 2012a); 957 female complainants, mean age 29 years (Crandall, 2003); 169 complainants (Derhammer et al., 2000); and 97 complainants (Ledray and Simmelink, 1997) respectively. Unless stated otherwise, mean age and gender of the complainants was not reported in the studies. Although multiple sites were utilised by some of the studies, all of the included sites provided both SANE and non-SANE services; some studies compared data collected both before and after

the implementation of a SANE service; others compared the provision of care to rape complainants when there was a SANE on shift to times when there was no SANE on shift.

4.2 RISK OF BIAS IN INCLUDED STUDIES

Of the eight studies included in this review, only one was assessed to be at low risk of selection bias (Bechtel et al., 2008). This study was considered to be at low risk of bias because it was a natural experiment with allocation to condition based on the department staff rota. That is, it was whether a SANE or non-SANE examiner was on duty at the time a complainant arrived for service. It is unlikely that complainant characteristics were related to staff rota and unlikely that staff were able to alter whether a SANE or non-SANE professional performed the examination. All complainants during the study period were included.

The remaining studies used a cohort or historical control group design. All complainants during a period of time when the hospital did not have a SANE examiner were compared to all complainants during a period of time when the hospital did have a SANE examiner.

The inclusion of all complainants during the study periods limits the potential for selection bias given that complainants do not self-select the timing of their victimisation and patient characteristics are unlikely to change systematically over time. However, it is entirely possible that there were historical changes that may have affected internal validity, such as changes to the hospital system or the criminal justice system's approach to handling sexual assault cases. No significant differences were noted between the time of day and treatment allocation across studies. None of the studies were able to blind participants and study personnel; however, one did refer to the blinding of outcome assessment (Bechtel et al., 2008). Only one study was judged to be free from attrition bias (Bechtel et al., 2008), and no study was without concern regarding either reporting or vested-interest bias. Figures 2 and 3 present a summary of the risks of bias across the included studies.

Figure 2. Risk of bias graph: investigators' judgements about each risk of bias item presented as percentages across all included studies

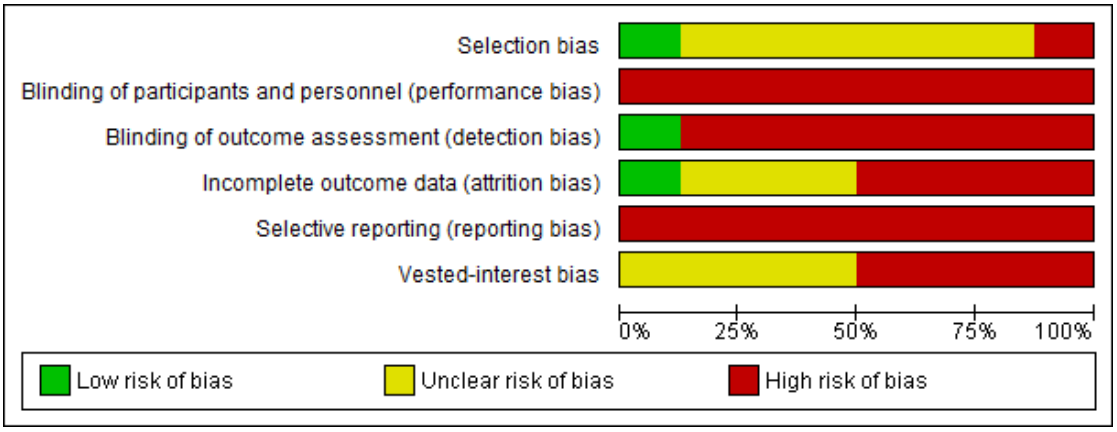
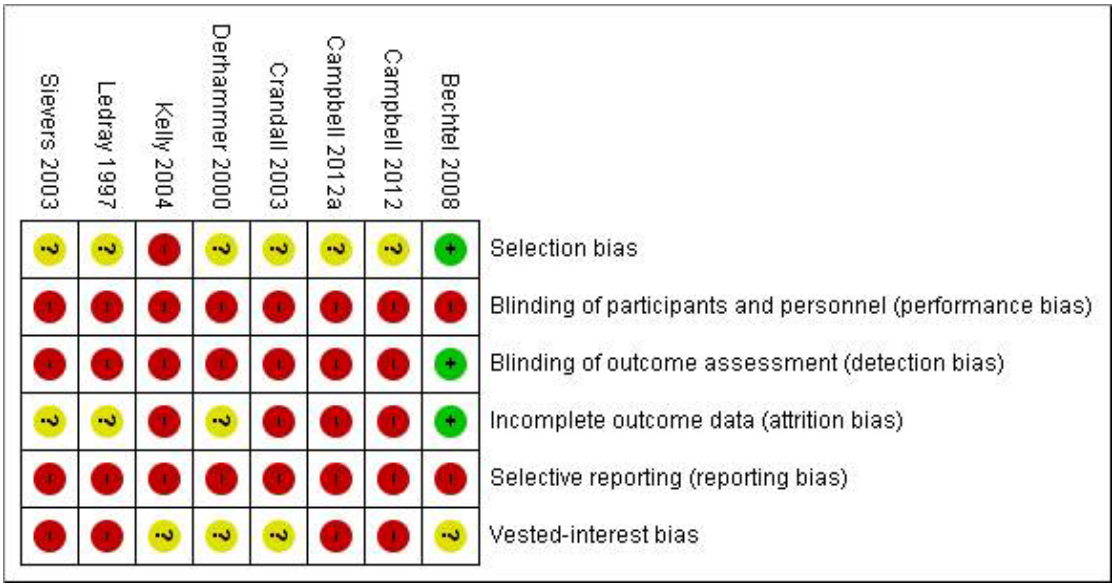


Figure 3. Risk of bias summary: investigators' judgements about each risk of bias item for each included study



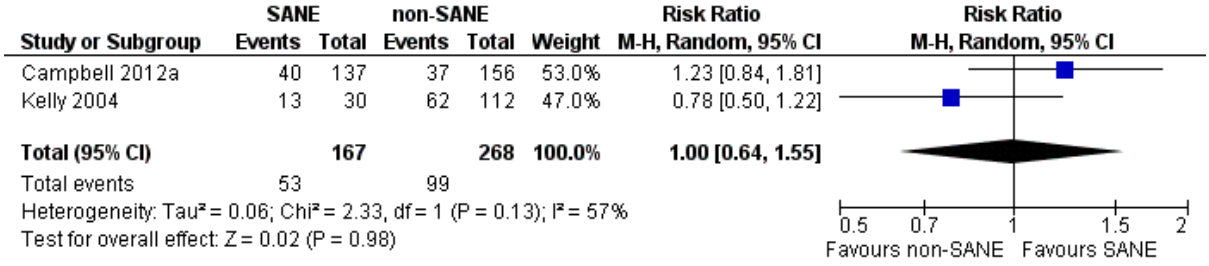
4.3 EFFECTS OF INTERVENTION

The results from the meta-analysis are outlined in Tables 1 and 2 and the Summary of Findings Table. Ninety-five percent confidence intervals (95% CI) were stated for all outcomes and the summary measures used were risk ratio (RR) for the binary outcomes and mean difference (MD) for the continuous outcomes.

Complainants' quality of life:
None of the included studies reported on this outcome.

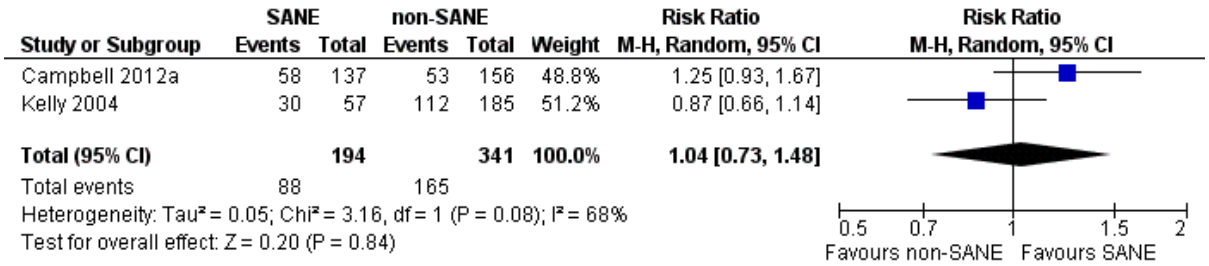
Proportion of cases resulting in conviction:
This outcome was reported in two of the included studies (Campbell et al., 2012a, Kelly, 2004). No significant differences were found between the two intervention groups (RR 1.00, 95% CI 0.64 to 1.55; Figure 4).

Figure 4. SANE versus non-SANE conviction rate



Proportion of cases resulting in prosecution:
This outcome was reported in two of the included studies (Campbell et al., 2012a, Kelly, 2004). No significant difference was found between the SANE and non-SANE groups in terms of prosecution rate (RR 1.04, 95% CI 0.73 to 1.48; Figure 5)

Figure 5. SANE versus non-SANE prosecution rate

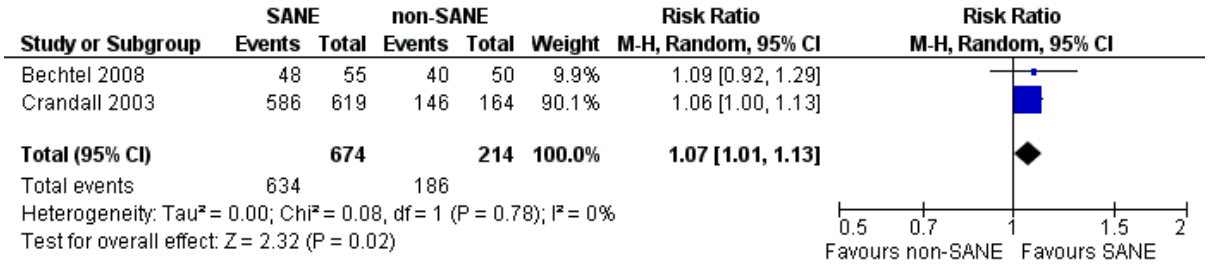


Complainant mortality within 30 days:
None of the included studies reported this outcome.

Time from complaint to examination:
None of the included studies reported this outcome.

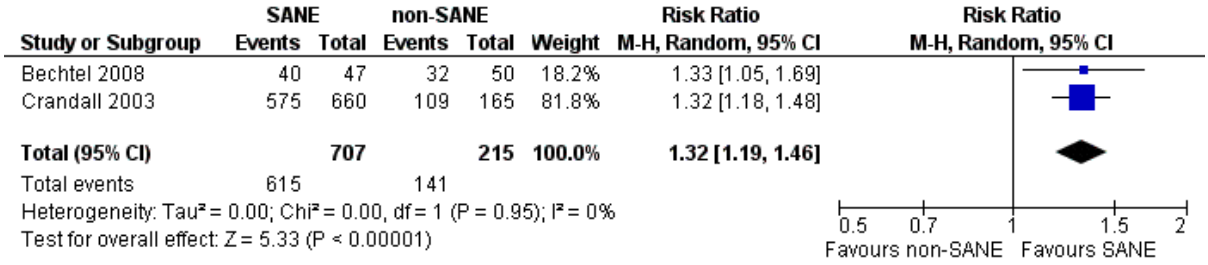
Provision of STI, pregnancy and HIV prophylaxis:
STI prophylaxis: Two of the included studies contributed data to the STI prophylaxis outcome (Bechtel et al., 2008, Crandall, 2003). A small, yet statistically significant difference was reported, favouring complainants who were treated by a SANE, in terms of the provision of STI prophylaxis (RR 1.07, 95% CI 1.01 to 1.13; Figure 6).

Figure 6. SANE versus non-SANE provision of STI prophylaxis



Pregnancy prophylaxis: Two studies were included in the analysis of pregnancy prophylaxis (Bechtel et al., 2008, Crandall, 2003). As with STI prophylaxis, complainants cared for by a SANE were significantly more likely to be offered pregnancy prophylaxis than those cared for by a non-SANE health professional (RR 1.32, 95% CI 1.19 to 1.46; Figure 7).

Figure 7. SANE versus non-SANE provision of pregnancy prophylaxis



HIV prophylaxis: Only one of the included studies reported on the provision of HIV prophylaxis (Bechtel et al., 2008), and observed no significant difference between the two intervention groups in terms of the provision of HIV prophylaxis (RR 1.29; 95% CI 0.87 to 1.89).

Proportion of complainants who had a rape kit collected:
It was possible to extract data for this outcome from two of the included studies (Crandall, 2003, Derhammer et al., 2000). No significant differences were found for this outcome (RR 2.79, 95% CI 0.21 to 36.38; Figure 8a). However, when a fixed-effects model was applied, a significant difference was noted, favouring complainants who had been treated by a SANE (RR 3.94; 95% CI 3.21 to 4.84; figure 8b). It was also noted that, where a rape kit had been collected, the likelihood of the case being referred for prosecution was significantly increased (Campbell et al., 2012).

Figure 8a. SANE versus non-SANE proportion of complainants with rape kits collected (random-effects model)

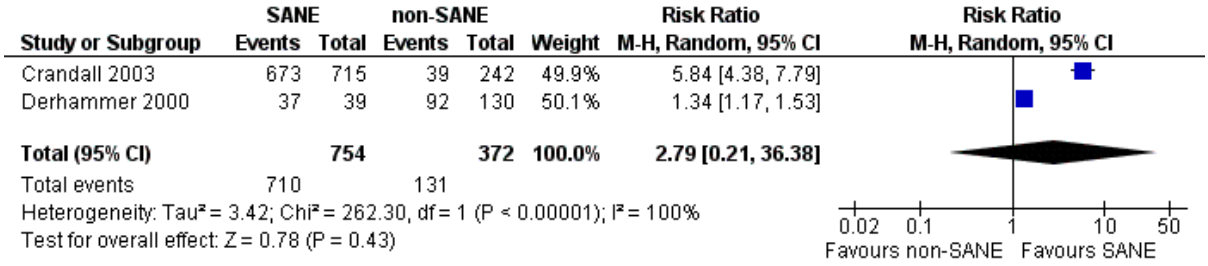
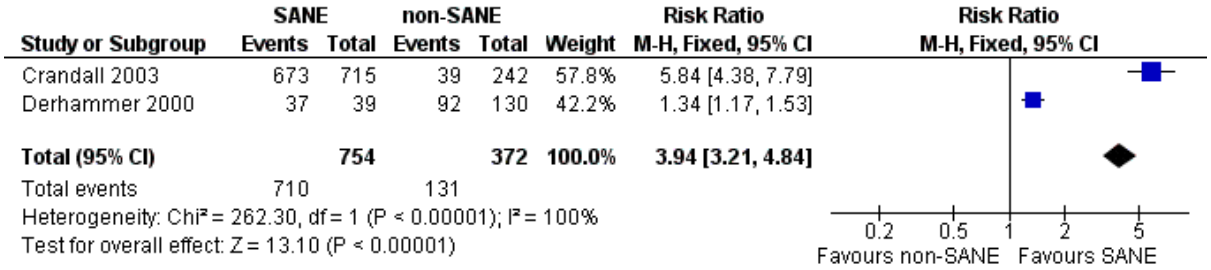


Figure 8b. SANE versus non-SANE proportion of complainants with rape kits collected (fixed-effects model)



Proportion of complainants who had a forensic examination documented:
This outcome was reported in three of the included studies (Bechtel et al., 2008, Crandall, 2003, Derhammer et al., 2000), and no significant difference was found between the two intervention groups (RR 2.28, 95% CI 0.65 to 8.01; Figure 9a). However, when a fixed-effects model was employed, this difference was significant (RR 3.21, 95% CI 2.71 to 3.80; figure 9b). It was also noted in one study that documentation of the forensic examination was more complete or thorough in cases where treatment had been given by a SANE (Bechtel et al., 2008).

Figure 9a. SANE versus non-SANE proportion of complainants in whom a forensic examination was documented (random-effects model)

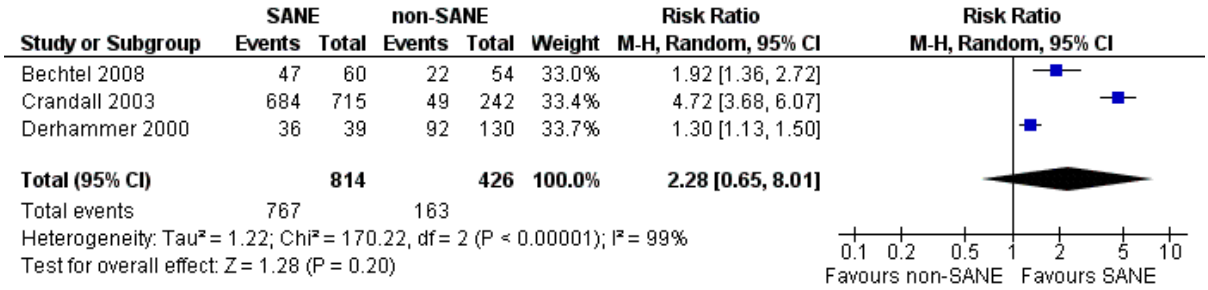
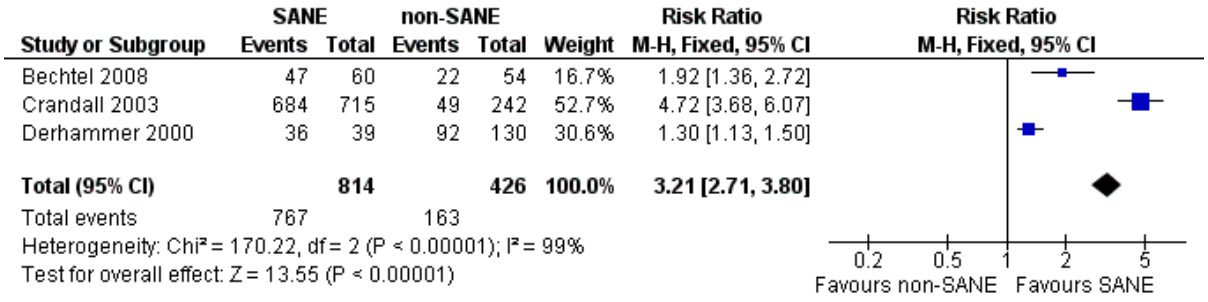


Figure 9b. SANE versus non-SANE proportion of complainants in whom a forensic examination was documented (fixed-effects model)



Number of rape kits admissible as evidence:
Only one of the included studies included data on this outcome (Ledray and Simmelink, 1997). This study found a statistically significant benefit to complainants cared for by SANEs in terms of the admissibility of their rape kit as evidence in court (RR 1.20, 95% CI 1.06 to 1.35). In addition to this, one of the studies included only for qualitative purposes did provide information regarding the accuracy of evidence collected by SANEs, compared with both doctors and non-SANE health professionals, with greater accuracy found in the case of forensic examinations conducted and reported by SANEs (Sievers et al., 2003). It was also reported that the rape kits were more complete and the chain of evidence less frequently broken when a SANE was involved in the case (Ledray and Simmelink, 1997, Sievers et al., 2003).

Cost per case:
Only one of the included studies documented this outcome (Kelly, 2004); however, as no standard deviation was reported, it is not possible to gauge the significance of the result. The results showed that utilising a non-SANE health professional in the provision of forensic examinations, in this case medical forensic doctors, costs were higher than when a SANE was utilised (non-SANEs £289 per case; SANEs £221 per case). The authors of this study did not indicate whether or not this difference was significant, nor did they provide information regarding the confidence intervals.

4.4 STATISTICAL VARIATIONS

Slight differences were noted between the fixed- and random-effects analyses; however, this only affected the significance of the results when considering the proportion of complainants for whom a rape kit was collected and the proportion for whom it was documented. No impact was noted when the effect measures were changed.

4.5 HETEROGENEITY

Significant statistical heterogeneity was noted in the following outcomes:

1. Proportion of cases resulting in prosecution ($Chi^2 = 3.16$, df = 1 ($P = 0.08$); $I^2 = 68\%$).
2. Proportion of complainants who had a rape kit collected ($Chi^2 = 262.30$, df = 1 ($P < 0.00001$); $I^2 = 100\%$).
3. Proportion of complainants who had a forensic examination documented ($Chi^2 = 170.22$, df = 2 ($P < 0.00001$); $I^2 = 99\%$).

Due to the small number of studies included, and the high levels of bias reported across these studies, it was not possible to perform either subgroup or sensitivity analyses for any of these outcomes.

Proportion of cases resulting in prosecution:
With regard to the analysis of prosecution rates, the I^2 would appear to suggest a significant element of heterogeneity in this outcome (I^2 = 68%; P = 0.08), a fact which would seem to be reinforced by the fact that the two studies included (Campbell et al., 2012a, Kelly, 2004) are reporting conflicting results. However, the overlap of the confidence intervals of these two studies, suggests that the same effect estimate may be being measured in both studies. However, the wide confidence intervals reflect an element of variability within the samples, which may be accounted for by sampling error. Heterogeneity has also been observed in the proportion of cases resulting in conviction; however, this is not significant (Chi^2 = 2.33, df = 1 (P = 0.13) I^2 = 57%).

Proportion of complainants who had a rape kit collected:
It is worth noting that, individually, the papers included in the meta-analysis of the number of rape kits collected report a statistically significant result, favouring complainants treated by a SANE. The exclusion of either study from the analysis of the number of rape kits collected does reduce the magnitude of the effect, which suggests that while there is consistency across the results reported by the two papers, they may be recording and reporting this outcome in different ways. It is also worth noting that the confidence intervals of the two studies (Crandall, 2003, Derhammer et al., 2000) do not overlap, which also suggests that the populations sampled in the two studies may be different. This suggestion is reinforced by the relatively narrow confidence intervals, which suggest good degree of precision and low variability within the respective samples. It may also be possible that there are significant differences in treatment effects, comparators or the methodologies employed across the included studies.

Proportion of complainants who had a forensic examination documented:
With regard to the documentation of the forensic examination, all three papers reported a significant difference between the two treatment groups. However, the result from the Crandall study, more specifically the effect measure and confidence interval, does not overlap with those of the other two studies, which may imply that the population sampled in this study is not the same as the two remaining papers. However, the direction of the effect estimate is the same in all three studies, which suggests that, while the populations involved may be different, the effect remains consistent across the studies.

4.6 PUBLICATION BIAS

Due to the limited number of studies included within this meta-analysis, it was not possible to accurately detect the presence of publication bias.

4.7 SUMMARY OF FINDINGS

Sexual Assault Nurse Examiners compared to Physicians for the initial forensic examination of the victims of rape and sexual assault

Patient or population: patients with the initial forensic examination of the victims of rape and sexual assault
Settings:
Intervention: Sexual Assault Nurse Examiners
Comparison: Physicians

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Non-SANE health professionals	**Sexual Assault Nurse Examiners**				
Conviction Rate Number of cases resulting in conviction	**369 per 1000**	**369 per 1000** (236 to 573)	**RR 1.00** (0.64 to 1.55)	435 (2 studies)	⨁⊖⊖⊖ **very low**[1,2,3,4,5,6]	
Prosecution Rate Number of cases put forward for prosecution	**484 per 1000**	**503 per 1000** (353 to 716)	**RR 1.04** (0.73 to 1.48)	535 (2 studies)	⨁⊖⊖⊖ **very low**[1,2,3,4,6,7]	
STI prophylaxis Proportion of patients offered STI prophylaxis	**869 per 1000**	**930 per 1000** (878 to 982)	**RR 1.07** (1.01 to 1.13)	888 (2 studies)	⨁⊖⊖⊖ **very low**[1,2,3]	
Pregnancy prophylaxis Proportion of patients offered pregnancy prophylaxis	**656 per 1000**	**866 per 1000** (780 to 957)	**RR 1.32** (1.19 to 1.46)	922 (2 studies)	⨁⊖⊖⊖ **very low**[1,2,3]	
HIV prophylaxis Proportion of patients offered HIV prophylaxis	**583 per 1000**	**752 per 1000** (507 to 1000)	**RR 1.29** (0.87 to 1.89)	60 (1 study)	⨁⊖⊖⊖ **very low**[3,6,8,9]	
Rape kits collected Number of patients for whom a rape kit was collected	**352 per 1000**	**982 per 1000** (74 to 1000)	**RR 2.79** (0.21 to 36.38)	1126 (2 studies)	⨁⊖⊖⊖ **very low**[1,2,3,10,11,12,13]	
Forensic examination documented	**383 per 1000**	**872 per 1000** (249 to 1000)	**RR 2.28** (0.65 to 8.01)	1240 (3 studies)	⨁⊖⊖⊖ **very low**[1,2,3,13,14]	

Documentary evidence that the forensic examination took place					
Kits admissible in a court of law Number of rape kits admissible as evidence in court	**822 per 1000**	**986 per 1000** (871 to 1000)	**RR 1.2** (1.06 to 1.35)	97 (1 study)	⨁⊖⊖⊖ **very low**[1,3,4,6]

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

[1] No blinding

[2] Incomplete outcome data

[3] Selective reporting

[4] Potential vested-interests

[5] Total sample size is less than sample size calculated for a single trial using PS: Power and Sample Size calculation software (n = 1307)

[6] Less than 300 events in total in both groups

[7] Total sample size less than the sample size calculated for single trial using PS: Power and Sample Size calculation software (n = 617)

[8] Only blinding of assessors

[9] Total sample size less than that calculated for a single trial using PS: Power and Sample Size calculation software (n = 101)

[10] No overlap of confidence intervals

[11] Significant heterogeneity I = 100%; Chi = 262.3 (P < 0.00001)

[12] Asymmetry on the funnel plot

[13] Risk ratio greater than 2

[14] Almost no overlap of confidence intervals and significant heterogeneity - I = 99%; Chi = 170.22 (P < 0.00001)

5 Discussion

This review has compared the overall reliability and efficacy of Sexual Assault Nurse Examiners (SANEs) versus non-SANE health professionals in the forensic examination of rape and sexual assault complainants. While data have been reported for adult services in both the UK and USA, paediatric cases have only been reported from the confines of a USA SANE programme (Bechtel et al., 2008). This may limit the generalisability of any findings pertaining to paediatric cases of rape and sexual assault to a UK population. Generalisability is also limited by the small number of relevant studies identified and the limited context and sample populations examined.

The most important outcome to consider is the quality of life of the complainants following both their rape and their treatment by either a physician or SANE. While it is unfortunate that none of the included studies reported on this, several service-user evaluations have been conducted, with the overall finding that a greater degree of control and empowerment was felt by complainants who were treated by a SANE (Campbell et al., 2008, Campbell et al., 2005). Also noted was a greater sense of empathy and feelings of support (Kelly, 2004). However, it is not clear how lasting these benefits may prove to be as no data are currently available regarding the longer-term effects on the complainant's quality of life when treated by a SANE, compared with those treated by a non-SANE, so it may be that they are only short-lived.

No significant differences were found between SANEs and non-SANEs in terms of either conviction or prosecution rates. However, as the overall quality of the evidence has been graded as very low, it is not possible to state that the SANE intervention had no effect on these outcomes, but simply that there was a lack of evidence. It is also not possible to rule out the possibility of statistical heterogeneity, despite their overlapping confidence intervals, which implies that the same effect estimate is being measured in both studies. What is important to note is the width of the confidence intervals. In both studies, these are quite wide, suggesting a large element of variability within the sample populations, which may reflect a degree of sampling error. This, consequently, reduces the power or precision of the point estimate and indicates heterogeneity within the sample. Also, as the direction of the effect is different in the two studies, this suggests that the outcomes (conviction and prosecution) are not consistent across the studies. However, while this is not

significant in terms of the conviction rates (P = 0.13), this does appear to be significant when considering the prosecution rates (P = 0.08). As both papers compare services offered to adult complainants, it would be reasonable to assume that differences in results could be accounted for by the differences in the services themselves, and may be tied into the fact that one paper has evaluated the service offered to rape complainants in the UK (Kelly, 2004), while the other has focused on the USA (Campbell et al., 2012b). It may also be that these conflicting results reflect differences in the UK and USA penal systems, or significant differences in the UK and USA control groups. In the UK, non-SANE healthcare professionals are typically highly trained forensic medical examiners. However, in the USA, non-SANE healthcare professionals are typically general emergency room physicians. Also, whereas the UK SANEs have no involvement in the prosecution and conduct of any criminal proceedings, their counterparts in the USA have a much greater and continued involvement with these cases. Indeed, within the USA courtrooms, the SANE is a well-accepted and respected source of expert testimony. This alone may lend greater credibility to the complainants of rape and sexual assault and, consequently, enhance the probability of any case moving forward to prosecution and conviction.

In terms of the clinical care of the complainants, SANEs were significantly more likely than physicians to offer both STI and pregnancy prophylaxis. No significant differences were found in terms of HIV prophylaxis. It is not clear whether these differences were due to the specialised training offered to the forensic nursing staff or simply that the nursing specialists were able to spend more time with the complainants. Also, the fact that SANEs are highly specialised and specifically trained to deal with complainants of rape and sexual assault, is likely to increase the possibility of their offering the most thorough and appropriate care to these individuals. Placing this in the context of the UK findings on the rates of conviction and prosecution, there seems to be a decision to be made in terms of care or criminal justice. While no significant differences were noted in terms of conviction or prosecution, in terms of clinical care, the complainants would seem to be offered a more comprehensive service if a SANE is involved in their case.

Regarding professional practice, the findings are dependent on the method of meta-analysis employed. Using the random-effects model, no significant differences were found in terms of the collection and documentation of the forensic examination when treatment is given by a SANE or a non-SANE health professional. However, using the fixed-effects model, the complainants were more likely both to have a rape kit collected, and to have this documented when a SANE was involved in their case. This is important, not only in terms of continuity of care and best practice, but also because cases are more likely to progress to conviction when a forensic examination has been documented (Bechtel et al., 2008). The accuracy of the forensic evidence collection process and, more specifically, the proportion of rape kits that can be used as evidence in court is also important. While only one paper reported this outcome

specifically (Ledray and Simmelink, 1997), the results suggest that when a rape kit has been collected by a SANE, it is significantly more likely to be admissible in court than those collected by a non-SANE health professional. This finding is indirectly supported by another study which has found that SANEs are more accurate, thorough, and less likely to breach the chain of evidence (Sievers et al., 2003).

With this in mind, it may well be that this is another factor to consider when addressing the current prosecution and conviction rates. It would appear that, not only does best practice need to be established, particularly in the UK, it should also be championed and enforced, to ensure the best possible legal and clinical outcomes for the complainants of rape and sexual assault. Also, while establishing the best approach to complainants of rape or sexual assault; it is worth noting that SANEs are, on average, £68 per case cheaper than their physician counterparts.

It may be worth considering at this point, the potential negative impacts of the increased reliance on SANEs. While this is not currently a major issue within the UK, the SANE programmes in the USA and Canada have now been operational for well over 30 years, and their impact has been noted. By far the most important factor to consider is the consequent de-skilling of doctors within the field of forensic examination. Indeed, many emergency department physicians are reluctant to conduct these examinations, feeling that they lack the specific training and experience to carry them out correctly (Campbell et al., 2012, Ledray and Simmelink, 1997). In cases where an emergency department physician conducts the forensic examination, this de-skilling may lead to the rape kit being collected incorrectly, a fact which has, to some extent been illustrated by the meta-analysis reported here (Ledray and Simmelink, 1997, Sievers et al., 2003). Also, a poorly conducted forensic medical examination may result in the complainant feeling re-victimised as a result of their negative experience. This, in turn, may increase the likelihood of the complainant choosing to withdraw their rape complaint (Campbell et al., 2012), which will likely impact negatively on both the proportion of cases being prosecuted and those resulting in conviction.

The withdrawal of rape complaints is a key factor to consider when investigating conviction rates because sexual assault cases have the highest attrition and lowest conviction rates of all serious offences (Lea et al., 2003). This may be reflected by the fact that, although the reporting of rape and other forms of sexual violence has increased, the actual conviction statistics have seen little change (Kelly et al., 2005). Attrition is the process whereby cases “drop out” of the criminal justice system at one of a number of points of exit from that system (Lea et al., 2003). These stages include the decision to report the offence, the investigation stage, discontinuance by the prosecutorial team, and acquittal or late withdrawal at the trial stage (Kelly et al., 2005, Lea et al., 2003). Up to two thirds of cases are dropped or drop out in the investigative stage. This includes withdrawal by the complainants, withdrawal due to evidential issues, and issues surrounding complainant credibility. As a result, it is

estimated that only around 14% of cases actually reach trial stage (Kelly et al., 2005). It may be that the implementation of a SANE-led service, which has been shown here to offer a more comprehensive level of care to the complainants of rape and sexual assault, may lead to an increase in the proportion of cases being reported, prosecuted and those resulting in conviction.

Returning to the initial question surrounding the overall efficacy and reliability of SANEs compared to non-SANE health professionals, it is important to consider the potential and desired consequences and ramifications of the substitution of forensic doctors with SANEs. In terms of conviction rates alone one could, perhaps, assume that a better service or better complainant experience could, in addition to improving the quality of the evidence gathered, lead to a greater willingness on the part of the complainant to both report and proceed with their case through the criminal justice system. Additionally, one would hope that by maintaining and improving links between the various agencies involved in such cases, we could instil a greater faith, on the part of the complainant, in the police force, Criminal Prosecution Service (CPS), and judicial system. This could, in turn, increase the number of complainants reporting and proceeding with their cases to trial.

With regard to the actual conduct and methodology of this review, it is worth noting that, despite a thorough and extensive search of all relevant databases and grey literature, no randomised controlled trials were identified, and those papers that were considered relevant only numbered eight. Also of note is the fact that only one of the six studies included in the meta-analysis reported data from the UK. While this sample population represented 56% of the complainants treated by a non-SANE health professional, only 20% of the SANE sample was accounted for by this study. This large imbalance in the sample sizes and the questions surrounding practice may undermine the generalisability of the findings of this review. It also calls into question whether the UK service is actually comparable to that in the USA. The significant heterogeneity reported in terms of the proportion of cases resulting in prosecution would seem to suggest not and it is not clear if the source of the heterogeneity is the SANE service itself, or fundamental differences between the UK and USA judicial systems. It is also important to consider the internal validity of the included studies, particularly those which employed a before-after study design. It may well be that, in addition to the change from doctor to SANE, there were also changes to hospital policy, facility provision and the judicial system.

In considering the generalisability of the results of this review to a UK population, it is worth investigating the potential differences between UK and USA services. While both SANEs and FNEs were introduced as a potential solution to the problem of recruiting and retaining female staff, the SANE programmes in the USA are well established and have been in operation for well over 30 years (Ledray and Simmelink, 1997); however, FNEs in the UK are relatively scarce. Indeed, the role itself has only been in development in the UK since around 2000 (Rutty, 2006). As

such, their services are not in routine use throughout the entire UK. This poses two important questions:

1. Are the USA SANEs better trained than the UK FNEs?
2. Do the two programmes operate in the same manner?

In the USA, nurses are required to complete in excess of 40 hours of classroom-based training, followed by 40 to 90 hours of clinical training prior to qualifying as a SANE (Campbell et al., 2012a, Sievers et al., 2003). However, in the UK there is currently no standardised training programme available to those wishing to specialise in forensic nursing. In addition to the potential impact of this factor on the skills and abilities of the FNEs, this may also lead to the FNEs having their credibility and capabilities questioned by the police, the complainants of rape and the CPS. This may, consequently, impact negatively on the prosecution and conviction rates in cases involving a FNE. This being said, this review has found no significant difference in rates of conviction and prosecution between complainants treated by FNEs and those treated by forensic doctors.

In the circumstances, the best available evidence from both published and unpublished sources was included. Also, the papers were selected by two independent reviewers, to ensure that all relevant studies were identified and included. The collaboration of two independent reviewers also ensured that, as far as possible, the studies provided relevant data, and that it was extracted correctly. Unfortunately it is not clear if the results reported here can be generalised to the UK because some outcome measures suggest differences between the UK and USA, whereas others suggest no significant differences. The fact that, comparatively speaking, the UK service is still very much in its infancy, whereas that in the USA is reasonably well established, may provide one reason for the reported differences and lack of available evidence and research. Another may be the differences in the UK and USA approaches to crime and justice. With this in mind, one could argue that the combination of data from these two very different services is inappropriate. It is entirely plausible to suggest that the heterogeneity between the two services is the main cause of the equivocal results reported here. However, in the absence of further research, the decision was made to proceed with all available data.

While the lack of randomised studies and lack of work within a UK population may limit the generalisability of the conclusions of this review, a number of key findings need to be borne in mind. Most importantly that the implementation of a nurse-led service does not seem to have a negative impact on prosecution and conviction rates and, in a majority of cases, leads to better provision of care, in terms of the STI and pregnancy prophylaxis offered to the complainants. However, perhaps the most important element of all has been missed here, that of the complainant him-/herself. Indeed, as Baroness Stern reports (Stern, 2010, pp101):

> *"By having an obsession with the attrition and conviction rates we are putting the criminal justice system at the centre, not the victim."*

This is a key point to consider; particularly in light of the finding that the vast majority of women feel that conviction is far less important than their overall treatment throughout the process of complaint, investigation, and prosecution (Stern, 2010).

6 Conclusions

6.1 IMPLICATIONS FOR PRACTICE

While there is a lack of evidence of effect in terms of conviction and prosecution rates, this review demonstrates the superiority of SANEs/FNEs in terms of clinical care, more specifically the provision of STI and pregnancy prophylaxis. This, taken in tandem with the fact that a FNE is around £70 per case cheaper than a forensic physician, would seem to lend strong support to further investigation of the on-going role of forensic nurses within the field of sexual violence.

6.2 IMPLICATIONS FOR RESEARCH

Research to investigate the quality of life of the complainants following their rape and forensic examination, both in the short and longer term is needed. This work should encompass not only physical aspects of the complainants' quality of life, but also any on-going emotional and psychological issues which may arise as a result, not only of the rape itself, but also as a consequence of the "secondary victimisation" experienced by many as a consequence of the forensic examination, police investigation and legal proceedings.

Studies evaluating the overall quality and efficiency of nurse- and doctor-led services in terms of time from complaint to examination, collection and documentation of rape kits and the admissibility of the evidence gathered from such kits should be conducted on a much larger scale than is currently the case. It is hoped that the results from studies of this type, when combined with those pertaining to the complainants' quality of life will provide more robust and conclusive evidence to either support of refute the implementation of a FNE-led service for the complainants of sexual assault.

Research to establish the barriers to the implementation of a nurse-led service for the forensic examination of the complainants of rape and sexual assault, along with a full economic analysis of the nurse- and physician-led services is also necessary, particularly with reference to a UK population.

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10 Tables

Data and analysis:

Table 1a. Summary of meta-analysis (random effects model)

Outcome	Studies	Participants	Statistical Method	Effect Estimate
Conviction rate	2	435	RR (M-H, random, 95% CI)	1.00 (0.64, 1.53)
Prosecution rate	2	535	RR (M-H, random, 95% CI)	1.04 (0.73, 1.48)
STI prophylaxis	2	888	RR (M-H, random, 95% CI)	1.07 (1.01, 1.13)
Pregnancy prophylaxis	2	922	RR (M-H, random, 95% CI)	1.32 (1.19, 1.46)
HIV prophylaxis	1	60	RR (M-H, random, 95% CI)	1.29 (0.87, 1.89)
Kit collected	2	1126	RR (M-H, random, 95% CI)	2.79 (0.21, 3.38)
Kit documented	3	1240	RR (M-H, random, 95% CI)	2.28 (0.65, 8.01)
Kit admissible	1	97	RR (M-H, random, 95% CI)	1.20 (1.06, 1.35)
Cost per case	1	496	MD (IV, random, 95% CI)	Not estimable

Table 1b. Summary of meta-analysis (fixed effects model)

Outcome	Studies	Participants	Statistical Method	Effect Estimate
Conviction rate	2	435	RR (M-H, fixed, 95% CI)	1.04 (0.78, 1.39)
Prosecution rate	2	535	RR (M-H, fixed, 95% CI)	1.05 (0.86, 1.29)
STI prophylaxis	2	888	RR (M-H, fixed, 95% CI)	1.07 (1.01, 1.13)
Pregnancy prophylaxis	2	922	RR (M-H, fixed, 95% CI)	1.32 (1.19, 1.46)
HIV prophylaxis	1	60	RR (M-H, fixed, 95% CI)	1.29 (0.87, 1.89)
Kit collected	2	1126	RR (M-H, fixed, 95% CI)	3.94 (3.21, 4.84)
Kit documented	3	1240	RR (M-H, fixed, 95% CI)	3.21 (2.71, 3.80)
Kit admissible	1	97	RR (M-H, fixed, 95% CI)	1.20 (1.06, 1.35)
Cost per case	1	496	MD (IV, fixed, 95% CI)	Not estimable

Study ID (author, date of publication)	Review primary outcomes				Review secondary outcomes					
	Quality of Life	Conviction	Prosecution	30-day Mortality	Time to Exam	STI, Preg, HIV Prophylaxis	Kit Collected	Kit Documented	Kit Admissible	Cost per Case
Bechtel 2008	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗
Campbell 2012a	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗
Crandall 2003	✗	✗	✗	✗	✗	○	✓	✓	✗	✗
Derhammer 2000	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗
Kelly 2004	✗	✓	✓	✗	✗	✗	✗	✗	✗	✓
Ledray 1997	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗

✓	Outcome fully reported
✗	Outcome not reported
○	Outcome partially reported

Table 2. Matrix of outcomes reported in the included studies

Characteristics of included studies:

Bechtel 2008

Methods	Cohort study	
Participants	Menarchal complainants and male adolescents with a history of sexual assault involving contact with the alleged perpetrators genitalia or with biological fluids from the alleged perpetrator, presented for medical evaluation, and requiring a forensic examination (n = 114).	
Interventions	• Paediatric SANE (n = 60). • Paediatric emergency department physicians (n = 54).	
Outcomes	• STI, pregnancy and HIV prophylaxis. • Documentation of forensic examination. • Time from assault to presentation.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Low risk	This was a natural experiment, with group allocation dependent on the duty rota for SANEs and doctors. No significant differences were noted between the time of day and treatment allocation.
Blinding of participants and personnel (performance bias)	High risk	Blinding is unlikely to have occurred.
Blinding of outcome assessment (detection bias)	Low risk	The outcome assessors were blinded to treatment allocation.
Incomplete outcome data (attrition bias)	Low risk	A consecutive series of complainants was included.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	Unclear risk	Some of the authors are likely to be SANEs. It would be in the investigators' best-interests to demonstrate the success and efficacy of their newly-established programme.

Campbell 2012

Methods	Cohort study. Data for the control group were collected prior to the implementation of the SANE programme; the intervention data after.
Participants	Sexual assault complainants meeting the following criteria: 1. The reported crime was classified as a criminal sexual conduct offense. 2. The complainant was at least 18 years old.

	3. The crime occurred between January 1994 and December 2005.	
Interventions	• SANE. • Emergency department personnel prior to the implementation of the SANE programme.	
Outcomes	• Prosecution. • Documentation of the forensic examination.	
Notes	Included only in the qualitative synthesis.	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Unclear risk	This was a natural experiment. Data were compared from participants before and after the implementation of the SANE programme. While there are not likely to have been changes to participant characteristics over time, it is not possible to rule out the potential for changes to both the hospital and/or prosecutorial systems.
Blinding of participants and personnel (performance bias)	High risk	Blinding not possible.
Blinding of outcome assessment (detection bias)	High risk	Blinding not possible.
Incomplete outcome data (attrition bias)	High risk	Data were not available for a significant number of pre-SANE cases.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	High risk	The main author performs collaborative research with SANE programmes.

Campbell 2012a

Methods	Cohort study.	
Participants	Inclusion criteria: 1. Adult sexual assault cases. 2. Complainant assaulted within the focal county. 3. Case investigated by one of the five largest police departments in the county. 4. A complete forensic medical examination conducted by either a SANE or county hospital personnel. 5. Examination results analysed by the state crime lab for DNA evidence. Exclusion criteria: 1. Complainant charged with false reporting. 2. Complainant retracted their statement. 3. Offender not identified. 4. Outcomes not available.	
Interventions	• SANE available (24/7) in a facility outside the hospital (n = 137). • County hospital personnel, prior to the implementation of the SANE programme (n = 156).	
Outcomes	• Prosecution. • Conviction.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Unclear risk	This was a natural experiment. Data were compared from participants before and after the implementation of the SANE programme. While there are not likely to have been changes to participant characteristics over time, it is not possible to rule out the potential for changes to both the hospital and/or prosecutorial systems.
Blinding of participants and personnel (performance bias)	High risk	Blinding was not possible.
Blinding of outcome assessment (detection bias)	High risk	Blinding was not possible.
Incomplete outcome data (attrition bias)	High risk	A number of eligible complainants were excluded.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	High risk	Themain author performs collaborative research with SANE programmes.

Crandall 2003

Methods	Cohort study. Data for the control group were collected prior to the implementation of the SANE programme; the intervention data after.	
Participants	Data for female complainants of sexual assault who were aged ≥ 18 years on January 1st 2000, who presented for forensic examination from 1994 to 1999.	
Interventions	• SANE (n = 715). • Emergency department staff prior to the implementation of the SANE programme (n = 242).	
Outcomes	• STI and pregnancy prophylaxis. • Number of rape kits collected. • Documentation of the forensic examination.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Unclear risk	This was a natural experiment. Data were compared from participants before and after the implementation of the SANE programme. While there are not likely to have been changes to participant characteristics over time, it is not possible to rule out the potential for changes to both the hospital and/or prosecutorial systems.
Blinding of participants and personnel (performance bias)	High risk	Blinding not possible.
Blinding of outcome assessment (detection bias)	High risk	Blinding not possible.
Incomplete outcome data (attrition bias)	High risk	Several complainants were excluded from various outcomes.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	Unclear risk	Funded by a National Institute of Justice grant. A poor outcome may reflect badly on the decision to fund SANE programmes.

Derhammer 2000

Methods	Cohort study. Data for the control group were collected prior to the implementation of the SANE programme; the intervention data after.
Participants	Rape complainants before and after the implementation of the SANE programme.
Interventions	• SANE (n = 39). • Medical examiners prior to the implementation of the

	SANE programme (n = 130).	
Outcomes	• Number of rape kits collected. • Documentation of the forensic examination.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Unclear risk	This was a natural experiment. Data were compared from participants before and after the implementation of the SANE programme. While there are not likely to have been changes to participant characteristics over time, it is not possible to rule out the potential for changes to both the hospital and/or prosecutorial systems.
Blinding of participants and personnel (performance bias)	High risk	Blinding not possible.
Blinding of outcome assessment (detection bias)	High risk	Blinding not possible.
Incomplete outcome data (attrition bias)	Unclear risk	Not reported.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	Unclear risk	Not reported.

Kelly 2004

Methods	Cohort study.	
Participants	Sexual assault complainants presenting between 1st October 2000 and 31st December 2002.	
Interventions	• Forensic nurse examiners (UK equivalent of SANE; n = 249). • Forensic medical doctor (n = 822). • Group assignment was based on which staff were available at the time the complainant was presented for examination	
Outcomes	• Conviction. • Prosecution.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	High risk	One nurse versus 13 doctors. Also the nurse examined more complainants during the daytime than the doctors. This could have affected the

		overall effect estimate.
Blinding of participants and personnel (performance bias)	High risk	Blinding not possible.
Blinding of outcome assessment (detection bias)	High risk	Blinding not possible.
Incomplete outcome data (attrition bias)	High risk	Not all records contained a complete set of data and those not undergoing forensic examination were excluded,
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	Unclear risk	The study was funded by the "Crime Reduction Programme, Violence Against Women" initiative. It is not clear what impact a negative outcome may have had.

Ledray 1997

Methods	Cohort study.	
Participants	Rape complainants who had evidence kits sent to the forensic lab. Kits were analysed between February and October 1996.	
Interventions	• SANE (n = 24). • Non-SANE and physicians (n = 73)	
Outcomes	Proportion of rape kits admissible as evidence in court.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Unclear risk	The selection process was not reported.
Blinding of participants and personnel (performance bias)	High risk	No blinding.
Blinding of outcome assessment (detection bias)	High risk	No blinding.
Incomplete outcome data (attrition bias)	Unclear risk	The authors reported requesting an audit of rape kits, yet only 97 have been presented in this report.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	High risk	One of the authors is a SANE.

Sievers 2003

Methods	Cohort study.	
Participants	Rape complainants who had a forensic examination and kit sent to one of three participating forensic labs. Kits submitted between October 1999 and April 2002.	
Interventions	• SANE (n = 276). • Non-SANE and physicians (n = 236).	
Outcomes	Accuracy of evidence collection.	
Notes	Included only in the qualitative synthesis.	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Selection bias	Unclear risk	The selection process was not reported.
Blinding of participants and personnel (performance bias)	High risk	Blinding unlikely.
Blinding of outcome assessment (detection bias)	High risk	Blinding unlikely.
Incomplete outcome data (attrition bias)	Unclear risk	A full rape kit was not collected for all complainants.
Selective reporting (reporting bias)	High risk	Important outcomes were not reported.
Vested-interest bias	High risk	The main author is a SANE.

Characteristics of excluded studies:

Study ID	Reason for exclusion
Ahrens 2000	Head of programme interviewed
Aiken 1995	Case report
Bernard 2005	No control group
Brayden 1991	Nurses/doctors surveyed
Burgess 2006	No separate data for SANE
Campbell 2005	Review
Campbell 2009	No control group
Campbell 2010	Police/prosecutors surveyed
Campbell 2011	No control group
Campbell 2011a	Non-comparative study
Christofides 2007	Doctors/nurses surveyed
Chu 2004	Comment on Sievers 2003
Fulginiti 1996	Non-comparative study
Ledray 2005	Non-comparative study
Lewis-O'Connor 2009	No separate SANE data
New study	Personal opinion
Patterson 2012	No control group
Pennington 2010	Paramedics utilised
Plichta 2007	Emergency department survey
Stermac 2005	No control group
Thomas 1993	Non-comparative study

11 Search strategies

11.1 PUBMED: 115

(((nurse) AND (practitioner* or specialist* OR clinician*)) OR "Nurse Clinicians"[Mesh] OR "Nurse Practitioners"[Mesh]) AND (medical practitioner* OR general practitioner* OR medical professional OR medical professions OR doctor OR doctors OR physician* OR "Physicians"[Mesh]) AND (rape OR rapes OR molest* OR ((sex OR sexual OR child OR children OR adolescent OR adolescents) AND (assault OR offence OR offences OR offense OR offenses OR unlawful sexual intercourse OR abuse OR abuses OR offence OR offences OR crime OR crimes OR delinquency)) OR "Sex Offenses"[Mesh])

11.2 EMBASE: 90

1. (nurse and (practitioner* or specialist* or clinician*)).af.

2. exp nurse practitioner/

3. 1 or 2

4. (medical practitioner* or general practitioner* or medical professional or medical professions or doctor or doctors or physician*).af.

5. exp physician/

6. 4 or 5

7. (rape or rapes or molest* or ((sex or sexual or child or children or adolescent or adolescents) and (assault or offence or offences or offense or offenses or unlawful sexual intercourse or abuse or abuses or offence or offences or crime or crimes or delinquency))).af.

8. exp sexual crime/

9. 7 or 8

10. 3 and 6 and 9

11.3 COCHRANE (ISSUE 2): 9

#1 (nurse and (practitioner* or specialist* or clinician*))

#2 MeSH descriptor Nurse Clinicians explode all trees

#3 MeSH descriptor Nurse Practitioners explode all trees

#4 (#1 OR #2 OR #3)

#5 (medical practitioner* or general practitioner* or medical professional or medical professions or doctor or doctors or physician*)

#6 MeSH descriptor Physicians explode all trees

#7 (#5 OR #6)

#8 (rape or rapes or molest* or ((sex or sexual or child or children or adolescent or adolescents) and (assault or offence or offences or offense or offenses or unlawful sexual intercourse or abuse or abuses or offence or offences or crime or crimes or delinquency)))

#9 MeSH descriptor Sex Offenses explode all trees

#10 (#8 OR #9)

#11 (#4 AND #7 AND #10)

11.4 SCI: 65

1 TS=(nurse and (practitioner* or specialist* or clinician*))

2 TS=(medical practitioner* or general practitioner* or medical professional or medical professions or doctor or doctors or physician*)

3 TS=(rape or rapes or molest* or ((sex or sexual or child or children or adolescent or adolescents) and (assault or offence or offences or offense or offenses or unlawful sexual intercourse or abuse or abuses or offence or offences or crime or crimes or delinquency)))

4 #3 AND #2 AND #1

11.5 GOOGLE SCHOLAR: 12

split into 2 searches because of word limit. Results 2 + 12 (the 2 results are included in the 12 results; total =12) – none relevant

Nurse; (practitioner or specialist or clinician); (medical practitioner or general practitioner or medical professional or medical professions or doctor or doctors or physician); (rape or rapes or molest* or assault or offence or offense)

Nurse; (practitioner or specialist or clinician); (medical practitioner or general practitioner or medical professional or medical professions or doctor or doctors or physician); (unlawful sexual intercourse or abuse or crime or delinquency)

Additional searches – 26/02/2012

The following three searches were conducted on the following databases:

- AMED
- BNI
- Cinahl
- Health Business Elite
- HMIC
- PsycInfo
- Social Policy & Practice

1. Sexual AND assault AND nurse AND examiner

1. exp Violence/ or exp Physical Examination/ or exp Forensic Nursing/ or exp Rape/
2. exp Specialties, Nursing/ or "Coroners and Medical Examiners"/ or exp Forensic Medicine/ or exp Rape/
3. exp "Reproducibility of Results"/ or exp Forensic Medicine/ or exp Sex Offenses/ or exp Crime Complainants/ or sexual offence examiner.mp. or exp Physical Examination/
4. (quality or reliability or credibility).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
5. 1 and 4
6. 2 and 4
7. 3 and 4
8. 5 and 6
9. 5 and 7
10. 6 and 7
11. remove duplicates from 8
12. remove duplicates from 10
13. conviction.mp.
14. 9 and 13
15. 10 and 13
16. 8 and 13
17. prosecut*.mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
18. 9 and 17

1. Sex offenses/ or Sexual abuse/ or rape.mp. or Jurisprudence/
2. sexual assault.mp.
3. molest*.mp. [mp=abstract, heading words, title]
4. Violence/ or Crime/ or "Predictive value of tests"/ or sexual crime*.mp.
5. unlawful sexual intercourse.mp. or Legislation/

6. 1 or 2 or 3 or 4 or 5
7. Knowledge/ or "Delivery of health care"/ or Nursing care/ or Nurses/ or Complainant care/ or nurse practitioner.mp. or Jurisprudence/
8. 6 and 7
9. doctor*.mp.
10. physician*.mp. or Physicians/ or Jurisprudence/
11. Professional practice/ or "Cost benefit analysis"/ or general practitioner*.mp. or Methods/
12. medical profession*.mp. or Professional practice/
13. 9 or 10 or 11 or 12
14. 8 and 13