Nurses plastering and splinting in the emergency department: an integrative review

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KEY WORDS

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ABSTRACT

Objective
Increasing numbers of presentations, high acuity of patients and a decreased access to hospital beds contribute to lengthy waiting times in Emergency Departments (EDs). Implementing models of care to improve patient flow through EDs is imperative. This integrative review was undertaken to evaluate existing evidence regarding the impact of nurses' plastering and splinting in EDs.

Setting
Data included in the review was drawn from five International databases that include publications exploring acute care interventions using PRISMA guidelines. An unbiased search and then application of exclusion criteria by three independent researchers delineated 11 papers for inclusion. Full-text analysis using a predefined framework enabled development of the primary outcomes.

Primary argument
The research question guiding this integrative review is:

> *What is the impact on patient and staff satisfaction, cost, ED length of stay, ED re-presentation rates when ED nurses apply plasters and splints to patients who present to ED with a fractured or sprained limb?*

While no literature focused specifically on outcomes from nurses applying plasters or splints, studies indicated that plastering, as part of a suite of nursing skills, had positive effects on patient outcomes such as reduced waiting times to treatment.

Conclusions
There is insufficient evidence to inform protocols for nurses to perform plastering and splinting. Further research evaluating the impact of nurses using this skill in their practice is required to support evidence-based practice.

BACKGROUND

Emergency Department (ED) health care workers are consistently under pressure due to increasing numbers of presentations, high acuity, complexity of patients and a decreased access to inpatient beds, all of which lead to crowding and lengthy waiting times (AIHW 2015; Sun et al 2013). These issues increase ED crowding in Australia and internationally (Green et al 2014; Perera et al 2014; Geelhoed and de Klerk 2012). In addition to a lower level of patient and staff satisfaction (Tekwani et al 2013; Pines et al 2008), ED crowding has been shown to increase patient morbidity and mortality (Sun et al 2013) and ED staff stress (Johnston et al 2016).

Various policy initiatives have been introduced to help manage ED crowding including the development and implementation of governmental key performance indicators that measure individual institution's performance against designated minimum Australian standards (Hudson and Marshall 2008). The National Emergency Access Target (NEAT) was introduced in Australia in 2012, with the goal that 90% of all patients be discharged or transferred from the ED within four hours (Keijzers 2014). While evidence suggests that NEAT has been beneficial in the generation and implementation of initiatives that address the problem of ED crowding and patient flow (Green et al 2014; Geelhoed and de Klerk 2012), more attention is required to address the specific needs and expectations for timely, quality care of the non-urgent group of patients, that often make up the majority of ED patient load (AIHW 2015; Muntlin et al 2006).

The Clinical Initiatives Nurse (CIN) role has been shown to support non-urgent patients by improving patient flow through the department, decreasing ED length of stay (due to early initiation of pain relief and pathology) and reducing workload for the medical officers (Fry et al 2012; Cant et al 2011; Combs et al 2006). The introduction of another advanced practice nursing role such as the Nurse Practitioner (NP) has also shown positive outcomes including increased patient satisfaction and decreased time to completion of advanced health assessments, investigations and symptom control (Martin-Misener et al 2015; Considine et al 2012a; Considine et al 2012b; Hudson and Marshall 2008). It has been suggested that nurses, working in minor injury and fast track units, be trained in plaster application and aftercare as part of quality delivery of patient services (Combs et al 2006; Rogers et al 2004; Cooke et al 2002).

Thus, the aim of this integrative review is to evaluate existing evidence to support the plastering and splinting application practices performed by ED nurses. The review focused on ED nurses (regardless of roles such as CIN or NP) and the skill of plastering and splinting application for patients who present to ED with a fractured or sprained limb. The research question that guided this review is: What is the impact on patient and staff satisfaction, cost and time-effectiveness of nurses applying plasters and splints, patient's length of stay, ED re-presentation rates and the frequency of patients who did not wait for treatment or who left after treatment commenced?

SEARCH STRATEGIES

This integrative review used the parallel, multi-stage process outlined by Pluye and Hong (2014) and included three assessors to ensure an unbiased application of key search, inclusion/exclusion and quality assessment strategies. This methodology, coupled with Whittemore and Knafl's (2005) framework, allowed for the inclusion of diverse literature which is critical in undertaking a review in which little is published. All studies were considered eligible for review including published, unpublished and grey literature.

The search strategy is represented in figure 1. The search terms used were: ED/EDs, Emergency department/s, Emergency room/s, ER/s OR A&E coupled with (AND) plastering, splinting, plasters, splints, fast track, fracture care, sprain, strain (AND) nurses. Activation of 'smart text' and automatic word variation options during searches ensured that word combination options including USA and UK spelling variations and pleural terms were

detected. Reference chaining (snowballing) was undertaken (Ellis 1989). All final searches were conducted in June 2015. The search processes and study selection conformed to PRISMA guidelines (Liberati et al 2009).

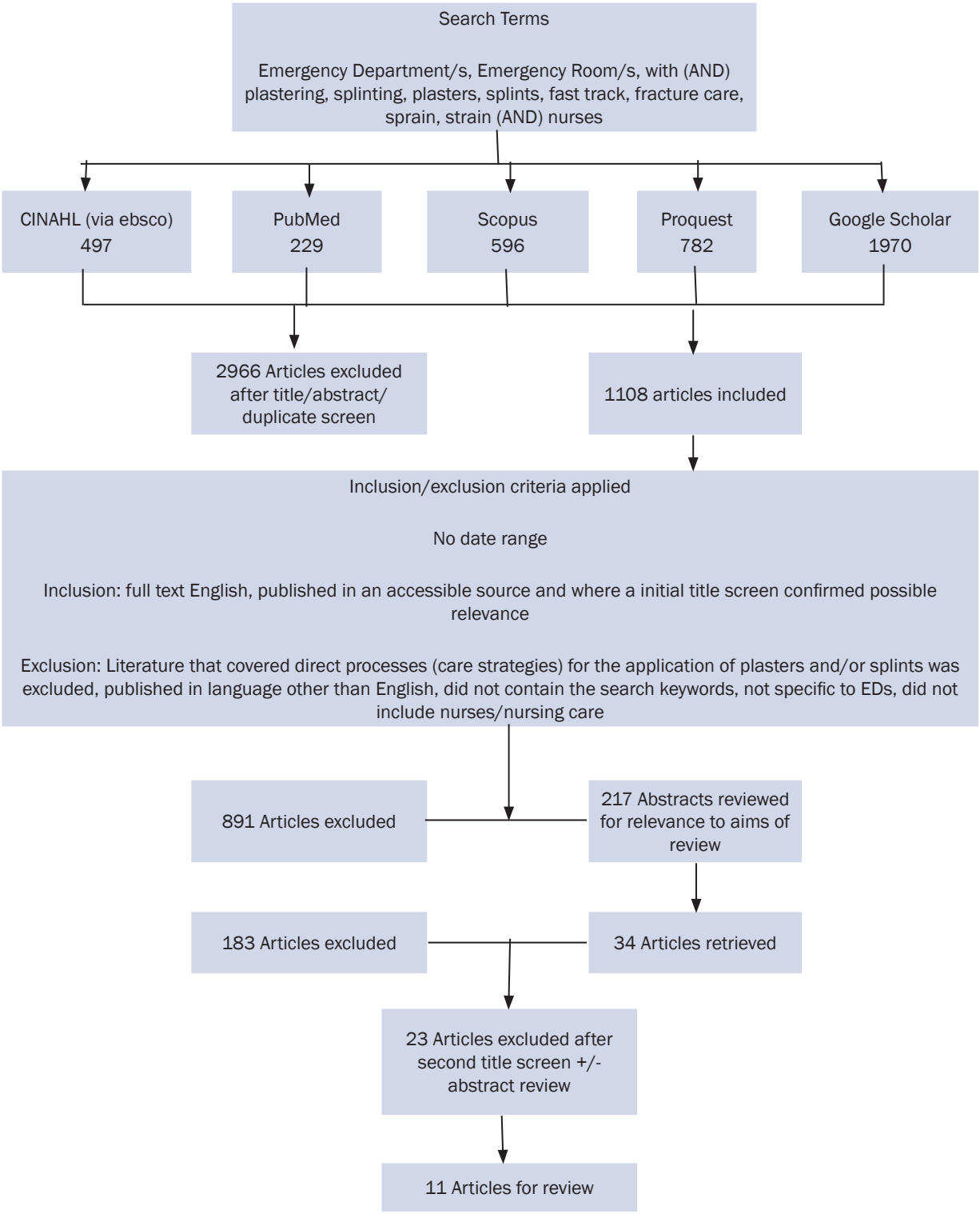

Figure 1: Schematic representation of the literature search strategy

Inclusion/exclusion criteria

Inclusion and exclusion criteria are presented in figure 1. Discussion papers and opinion pieces were included. A date range for inclusion/ exclusion was not applied in order to include any historical basis for nurses' application of plasters.

Two reviewers screened 217 titles and abstracts initially retrieved for potential inclusion using specific criteria. From those, 34 full text articles were retrieved. Review of the full text articles and a final moderation process indicated that 11 articles met the criteria. Library searches were unable to obtain full text for two older studies (<1993) which were excluded. Data were extracted by two authors, summarised and reviewed by a third author to ensure unbiased extraction processes (Whittemore and Knafl 2005). The literature was summarised and is presented in table 1.

Study evaluation

This review used the Mixed Methods Appraisal Tool (MMAT) (Souto et al 2015; Pluye and Hong 2014) to evaluate the quality of evidence. MMAT scores were calculated to determine the level of evidence for each article. There was a 90% match rate in the quality appraisal scores between the three authors who undertook the assessment of included articles. Where differences arose, a consensus resolution approach was used to agree on a final rating.

RESULTS

Eleven articles were included in the review however two articles were published from progressive sections of the same project (see table 1). Five of the articles were general discussion/opinion papers rather than formal research studies (Azbug 2015; Hudson and Marshall 2008; Miles 2004; Smith 1994; Purnell 1991;). These articles were included due to the integrative review approach taken (Whittemore and Knafl 2005).

There were no studies that focused specifically on outcomes resulting from nurses applying plasters or splints. However, some studies (Hudson and Marshall 2008; Combs et al 2006; Miles 2004; Smith 1994) included plastering as part of a suite of advanced nursing skills that showed positive efficiency gains for patients and EDs. These gains included decreased numbers of patients who did not wait for treatment. Two studies showed evidence that suggested nurses who performed plastering in addition to other advanced skills improved the clinical team's performance indicators by reducing waiting times to assessment/treatment as well as the 'Did Not Wait' rates in Fast Track care models (Considine et al 2010; Considine et al 2008; Combs et al 2006; Purnell 1991). The Fast Track models were described as processes whereby patients with low acuity (Australasian Triage Scale 4 and 5; the standardised system for patient priority allocation used in Australian public hospitals) would be seen and treated in a dedicated area by either a nurse or a doctor. There was no focus on the impact of specific individual skill sets like nurses' plastering/splinting in the contribution to the overall efficiency of such models of care (Miles 2004), although a broad economic evaluation study of nurses work in such areas indicated they could potentially be cost effective (Dochterman et al 2001).

While discussion papers explored various advanced practice nursing roles within Australia, with a focus on the CIN role in the ED setting, there were no evaluations of the impact of nurses performing plastering or splinting on patient flow, nurse satisfaction with performing these skills or workload management (Hudson and Marshall 2008; Combs et al 2006; Miles 2004; Smith 1994). Purnell (1991) made reference to emergency nurses applying plasters and splints which improved patient flow, however did not examine the impact of this procedure on staff satisfaction, morale or retention. Another article discussed case presentations used to demonstrate that plasters and splints were often applied incorrectly by all clinician groups (doctors, nurses and technicians), causing adverse events (Azbug 2015). Similar to another discussion paper, a recommendation

was to provide adequate training and education in plaster application through a formal certification process (Miles 2004).

Two studies evaluated overall quality of care delivered by an ED Fast Track unit together with patient satisfaction with care delivery in comparison of medical officer and nurse practitioner (Lutze et al 2014; Dinh et al 2012). The studies found high patient satisfaction scores for a Fast Track unit functioning with senior medical and nursing staff in advanced practice roles, with satisfaction scores being slightly higher for care provided by a nurse practitioner than a medical officer. Whilst the studies had some relevance for this review, due to the focus on patient satisfaction with care delivered by an advanced practice nursing role, there was no correlation to plastering and/or splinting. It was acknowledged that there were different skills, training and knowledge held by NPs than other advanced practice nursing roles and therefore the applicability of these results is limited.

Within the applied search parameters, there was only one article found that considered evaluating the cost of nursing interventions, for which plastering and splinting were included (Dochterman et al 2001). There were no papers found that evaluated or discussed the role of nurses in performing plaster aftercare or reviews on patients with unscheduled re-presentations to ED with a plaster or splint related concern. The studies varied widely in quality, from those that did not conform to a research process, including discussion papers such as Hudson and Marshall (2008) and were unable to be rated using MMAT, to studies with an excellent methodological basis such as that by Dinh et al (2012).

DISCUSSION

Despite the number of plasters and splints applied in EDs nationally and internationally, there is limited literature to support development of an evidence-based model for plastering and splinting in EDs, particularly by nurses. Very few studies examined patient and staff satisfaction with plaster/splint application, evaluated the cost and time-effectiveness of nurses applying plasters and splints, or undertook comparative evaluation of the impact of nurses application of plasters and splints on patient's length of stay, re-presentation rates, the rates of patients who did not wait for treatment or who left after treatment was commenced. Thus our review has identified several gaps in the literature in regards to the application of plasters and splints in ED and specifically the impact of nurses gaining the skills of plastering and splinting to treat patients with simple sprains/fractures in EDs.

There is literature discussing the benefits of nurses developing and using skills such as plastering and suturing in a Fast Track model of care to gain efficiencies in ED patient flow (Considine et al 2010; Combs et al 2006; Purnell 1991). Advanced practice nursing roles that include plastering and splinting are suggested as a way to develop the nurse's clinical assessment skills and can lead to improved documentation skills (Hudson and Marshall 2008; Smith 1994). Lutz et al (2014) suggested that enhancing ED nurses skill-sets could offer genuine benefit to patient care and satisfaction. Some studies were more focused on the multidisciplinary model of care with a range of potential contributing factors such as seniority of clinician, than on the specific skill sets and any evidence based merit for inclusion in such a model of nursing care. Findings of the studies included in this review can be contextualised within broader literature that discuss advanced practice nurses and medical staff in the care of patients with 'minor' injuries (Considine et al 2012a; Considine et al 2010) and with the overall nurse skill set and scope of practice (Gray 2016; Campbell et al 2015; Stauber 2013).

There were several discussion papers that supported advanced practice skill sets for emergency nurses in order to improve assessment, documentation and care delivery (Hudson and Marshall 2008; Smith 1994). However, these were primarily opinion or anecdotally-based pieces that could be strengthened with clinical research on this topic. While speculation and anecdotal reports about the benefits of nurses applying plasters

and/or splints, and/or review of patients' plasters are interesting (Kelly et al 1996), evidence is required in order to support nurses who perform these procedures.

Where nursing roles have been extended in EDs, assessing and evaluating outcomes underpin the development of skill sets and further implementation of such roles within clear frameworks (Bryant-Lukosius et al 2016; Gray 2016; Stauber 2013). With increasing ED patient presentations and subsequent ED crowding, it is important that effective patient flow strategies be implemented and evaluated to ensure they support the health service, staff and quality patient care. This includes examination of different types of nursing skills on the efficacy and cost-effectiveness of EDs (Bryant-Lukosius et al 2016; Gray 2016).

LIMITATIONS

This review was limited to articles published in English. Due to the paucity of literature available, this review used an integrative framework that allowed inclusion of discussion/opinion papers that were not evidence-based, highlighting the need for quality research in this area.

CONCLUSION

This integrated review of the literature on the effectiveness of nurses plastering and splinting in EDs found a lack of evidence to support the anecdotal benefits of this practice. However, the perceived benefits that have been reported are potentially significant and warrant further attention. There is limited evidence to guide protocol development for nurses to perform plastering and splinting on patients who present to ED with limb sprains or fractures. Further research is recommended to evaluate the impact of ED nurses plastering and splinting on patient satisfaction, ED length of stay, re-presentation rates, patient flow and health care costs.

RECOMMENDATIONS

Given the ongoing pressures faced by EDs both in Australia and internationally to improve patient throughput, reduce waiting times to treatment, and maintain a high quality of patient care, it is recommended that further research be undertaken to explore the role of nurses applying plasters and splints with a view to developing an evidence based approach to this practice (Bryant-Lukosius et al 2016).

Table 1: Data extraction summary

Author, year country	Aim/s	Sample	Research design/tools/ analysis type‡	Rigor, reliability, validity	Findings	Strengths	Limitations§	Recommendations/ implications	MMAT* %
Abzug 2015 Baltimore, USA	Evaluation of splints applied in community hospital EDs and urgent care centres	275 patients	A discussion paper describing new research from University of Maryland No method or tools mentioned.	N/A	90% of splints were applied incorrectly from all clinicians including doctors, technicians and nurses.	Discussion to stimulate further research	Final study not found in peer-reviewed journal.	Study suggests the need for more training and education on proper splinting techniques.	N/A
Dinh et al 2012 Sydney, Australia	1. Describe overall quality of care delivered by a fast track unit 2. Compare quality of care provided by ED NPs vs Drs	Convenience sample of 320 patients triaged to fast track.	Observational design. Pt satisfaction measured on self-administered satisfaction survey instrument completed prior to discharge.	Descriptive statistics used to summarise overall quality of care. Study group comparisons using inferential statistics.	High patient satisfaction scores for care in the fast track unit. Patient satisfaction scores slightly higher for NP pt group than Dr group. Shorter waiting time to treatment in NP group.	Assessment of patient satisfaction.	Uses NPs not RNs. Doesn't specify impact of skills such as plastering. May have selection bias due to convenience sampling with only 75% response rate.	Useful for comparison of patient satisfaction - could translate to RN vs. Dr/ other plastering and pt satisfaction.	100
Considine et al 2008 Melbourne, Australia	Examine the effect of fast track on emergency department (ED) length of stay (LOS) in a public teaching hospital	ED Fast Track patients (1.1.07-31.3.07) Usual ED patients (controls) (1.7.06 to 15.11.2006 (n = 822 matched pairs).	Pair-matched case–control design.	Power calculations undertaken. Robust design.	ED fast track decreased ED LOS for non-admitted patients who were significantly more likely to be discharged within 2 hours without compromising waiting times and ED LOS for other ED patients.	Case control Quantitative study exploring a legislative requirement (NEAT)	Unmatched data periods, no adjustment for increasing patient numbers. Study conducted immediately after the implementation of fast track. No assessment of service quality.	Implementation of a Fast Track area can help reduce ED crowding and access block.	50

Hudson & Marshall 2008 NSW, Australia	Article discussing the different roles of advanced practice nursing in Australia and examines advantages/ limitations. Discusses the CIN role with brief inclusion of plastering/ splinting as a skill.	Nil specific. Discusses NP role along with CIN role.	Discussion / literature review of advanced nursing roles in ED.	N/A	Clinical Initiative Nurse/ advanced practice nurse role programs that include plastering/ splinting were believed to develop nurses' clinical judgement & assessment skills, improve documentation and referral to ED medical officers.	Quality literature review strategy Good historical perspective	No reference to LOS.	A descriptive study is recommended to provide knowledge on various skills performed and educational preparation involved.	N/A
Coombs et al 2007 Part 2 Perth, Australia	1. Reduce patient delays for receiving treatment; 2. Decrease DNW rate; 3. Reduce the journey time for ED patients. 4. Predict the daily bed requirements for ED patients waiting to be admitted to ward areas.	All patients presenting to an outer-metropolitan ED in WA between 1 Aug 2004- 31 May2005.	Pilot study- 12 month evaluation Patient Flow Collaborative Methodology	Limited data (pilot test)	Steadily decreasing DNW numbers. ED throughput of admitted patients <12 hrs LOS. Initial improvement not sustained. ED patient journey times remained stable. Fast Track length of stay remained stable. Authors state that implementation of Fast Track and enhancement of nursing roles (suturing and plastering) reduced patient waiting times and DNW rate	Quantitative, data exploring.	Despite claiming that enhancing nursing roles through an education program encompassing suturing and plastering led to reduced patient waiting times and DNW rates- there was no data results displayed. No staff satisfaction surveys taken.	Change process is sensitive and requires pre and post monitoring. Dedicated resources are required to ensure process change is well supported – including an executive staff member.	75

Coombs et al 2006 Part 1 Perth, Australia	Discusses the process of identifying the need for Fast Track and the journey undertaken to implement the initiative. (see also Part 2 above)	All patients presenting to an outer-metropolitan ED in WA - No exact sample size given.	Discussion paper.	N/A	Reduction in DNW- no figures provided. Staff identified need for nursing staff to be upskilled in suturing and plastering to ensure patients seen in a timely manner- no further data given. Patients identified as having minor injuries and or illnesses were being seen, treated and discharged within two hours- during pilot study period. Improved staff recruitment and retention rates due to nursing staff being able to advance their skills in plastering and suturing. The authors assert the introduction of fast track led to: increased staff morale and offering better opportunities for nursing staff.	Acknowledge advanced nursing skills part in improving LOS and DNW.	Fast Track was staffed by senior registrars or consultants and a senior nurse with suture and plastering skills- no data to differentiate if advanced nursing skills improved LOS or flow.	Fast-track decreases ED length of stay. Nurses increased their clinical skills by undertaking advanced practice education and training. Increased staff morale.	N/A

Lutze et al 2004 NSW, Australia	Compare patient satisfaction of ED Fast Track care between Dr run and NP run	Convenience sample of 353 pts: 212 in Dr group, 141 in NP group. 4 week period. Multi-centre- 2 x sites.	Observational study This pilot study was the foundation for subsequent study by Dinh et al 2012. Pt satisfaction measured on self-administered satisfaction survey instrument completed prior to discharge.	Univariate analysis to compare study groups based on treatment site.	Most patients were satisfied with ED fast track, irrespective of model of care. Pt satisfaction was greater in NP group.	Quantitative data using patient satisfaction survey.	Uses NPs not RNs. Doesn't specify impact of skills such as plastering. May have selection bias as only 1/3 of pats at one site completed surveys.	Useful mainly for comparison of patient satisfaction tool- could translate to RN vs Dr.	75
Miles 2004 UK	Opinion paper from RN/ Plaster technician on the requirement for adequate education and training of nurses and doctors in applying plasters.	Nil	Opinion paper/ discussion only	N/A	Used multiple case studies to emphasise the potential adverse events of inappropriately applied plasters. Advises the importance of adequate training and education in plaster application- recommends formal certificate training.	Advises the need for adequate training for staff.	Based on opinion and a few case studies. No discussion of impact on LOS or nurse satisfaction.	Appropriate education and training- preferably formal certificate.	N/A
Dochterman et al 2001 Iowa, USA	Determine the costs of nursing service	433 Nursing Intervention Classifications (NIC) were reported. (Actions performed by nurses).	Nursing experts evaluated each intervention in order to assign the time and minimum level of education required to perform each task.	Validated economic models and assessment tools used systematically.	Identifying costs for specific nursing interventions allow for evaluating the cost effectiveness of nursing care.	Broad approach to costing of nurses' work using sophisticated economic modelling.	Study design was unclear. A review of the NICs and to confirm that these NICs were true and accurate.	Economic evaluation of care processes is a key part of evaluation of service delivery	75

Smith 1994 UK	Opinion paper on skill advancement for ED nurses.	Nil	Opinion paper/ discussion	N/A	Opinion that ED nurses gaining specialist knowledge including plastering and suturing can offer 'genuine benefits to patient care, as junior A&E medical staff often lack them'.	Takes a strong nursing advocacy position.	Based on opinion. No data/ studies or reference to support this assertion. No definition of what constitutes benefits to patient care. Doesn't mention LOS or nurse satisfaction.	Increasing nursing skill set can improve morale and self-efficacy.	N/A
Purnell 1991 USA	Examining the characteristics of existing triage systems in 5 mid-Atlantic US States. Including the qualifications and training of tirage nurses and skills performed	185 surveys of nurses from 5 different EDs.	44- item questionnaire	Non-validated survey	The presence of a Fast Track system significantly decreased patient waiting time by 20%. In some facilities- triage nurses applied plaster casts and sutured.	Cross departments providing a broad picture	No focus on the impact of nurses plastering on LOS, pt or staff satisfaction.	Recommended expanded study outside of State.	75

‡Data type (quantitative/qualitative) is identified in the study and/or on the basis of the analysis performed

§ Note: All survey and interview data is subject to potential prevarication bias and response falsification. Additionally, there may be a response bias based on the psychological wellbeing of participants (single point in time survey)

*Mixed methods assessment tool (MMAT) classification system

Abbreviations: DNW, did not wait; N/A, not applicable; NEAT, National Emergency Access Target; pt, patient; LOS, length of stay

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