

STATE OF THE ART / SYSTEMATIC REVIEW

A systematic review of the impact of nurse practitioners on cost, quality of care, satisfaction and wait times in the emergency department

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SEE RELATED COMMENTARY, PAGE 297.

ABSTRACT

Introduction: US emergency personnel cared for 106% more patients in 1990 than they did in 1980,¹ and national emergency department census data show that 60%–80% of those patients presented with non-urgent or minor medical problems. The hiring of nurse practitioners (NPs) is one proposed solution to the ongoing overcrowding and physician shortage facing emergency departments (EDs).

Methods: We conducted a systematic review of MEDLINE and Cinahl to find articles that discussed NPs in the ED setting, looking specifically at 4 key outcome measures: wait times, patient satisfaction, quality of care and cost effectiveness.

Results: Although some questions remain, a review of the literature suggests that NPs can reduce wait times for the ED, lead to high patient satisfaction and provide a quality of care equal to that of a mid-grade resident. Cost, when compared with resident physicians, is higher; however, data comparing to the hiring additional medical professionals is lacking.

Conclusion: The medical community should further explore the use of NPs, particularly in fast track areas for high volume departments. In rural areas, NPs could supplement overextended physicians and allow health centres to remain open when they might otherwise have to close. These strategies could improve access to care and patient satisfaction for selected urban and rural populations as well as make the best use of limited medical resources.

Key words: Nurse practitioner, emergency medicine, health care quality, access and evaluation

RÉSUMÉ

Introduction : Aux États-Unis, le personnel des services d'urgence a traité 106 % plus de patients en 1990 qu'en 1980,¹ et les données de recensement à l'échelle nationale sur les services d'urgence révèlent qu'entre 60 % et 80 % de ces patients présentaient des problèmes médicaux non urgents ou mineurs. Le recours à des infirmières praticiennes (IP) est une solution que l'on propose pour alléger la surcharge de travail et la pénurie de médecins dans les urgences.

Méthodes : Nous avons fait une recension systématique des articles dans MEDLINE et Cinahl portant sur les IP dans les urgences, en s'attachant plus précisément à quatre mesures de résultats clés : les temps d'attente, la satisfaction des patients, la qualité des soins et la rentabilité des coûts.

Résultats : Même si certaines questions restent en suspens, une recension des écrits nous indique

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que le recours à des IP peut réduire les temps d'attente aux urgences, accroître la satisfaction des patients et assurer une qualité de soins égale à celle que fournirait un résident en mi-formation. Le coût est plus élevé lorsqu'on le compare à celui de médecins résidents; toutefois, nous n'avons pas de données permettant d'établir une comparaison avec le coût de l'embauche de professionnels de la médecine supplémentaires.

Conclusion : Le milieu médical aurait avantage à examiner plus avant l'utilisation des IP, surtout dans les secteurs prioritaires des services achalandés. Dans les régions rurales, les IP pourraient prêter main-forte aux médecins surchargés et permettre ainsi d'éviter la fermeture de centres de santé. De telles stratégies pourraient améliorer l'accès aux soins et la satisfaction des patients de certaines populations urbaines et rurales tout en faisant un usage optimal des ressources médicales limitées.

Introduction

Emergency departments (EDs) assume many important roles in the health care system beyond their obvious functions as trauma centres and providers of urgent and emergent care. National ED census data from the United States shows that 60%–80% of ED patients present with non-urgent or minor medical problems.¹ For years, EDs have substituted for unavailable private practitioners and served as a primary care provider for the urban poor.² Access to emergency care is not limited to the urban population. Rural physicians are called upon to provide increasingly demanding hours of emergency coverage as their numbers dwindle. Many rural EDs and health centres have been forced to limit their hours of service owing to lack of physicians, which in turn obliges the area's population to seek emergency care in other more distant communities.

One suggested solution to these increasing pressures is to employ nurse practitioners (NPs). In the urban setting, this often represents additional staffing in dedicated non-urgent or fast-track areas. In the rural setting, NPs could staff low volume EDs in which a physician is on call off-site or accessible by telemedicine.³ The concept of an ED NP is not new, with literature on the subject dating back almost 30 years,^{4–11} citing increased quality, cost-effectiveness, reduced wait times and improved patient satisfaction.¹ Although the scope of the NP's practice in the ED remains highly variable, he or she must possess the knowledge and skills to make autonomous decisions regarding selected patient populations as well as be accountable for his or her actions.^{12,13} NPs are covered by their own malpractice insurance and their own license. They may or may not be able to prescribe medications.

The increase in ED volume combined with difficulty in recruiting adequate physicians has put mounting pressure on hospitals and health care planners to find innovative ways to ensure high-quality, efficient care. The NP role has thus emerged not only because of academic and profes-

sional development, but also because of worsening physician workforce numbers.^{14,15} Although a detailed discussion of ED overcrowding is beyond the scope of this paper, the submission of the Canadian Association of Emergency Physicians to the Romanow Commission on the future of emergency medicine in Canada described the concept of using NPs and other physician extenders as “garnering interest” and maybe helpful.¹⁶ This discussion will focus solely on the potential role of the NP in the ED, recognizing the potential contribution of other extended providers such as physicians' assistants. This review of the literature seeks to answer the question of whether hiring NPs for the ED can reduce wait time, improve patient satisfaction and provide care of reasonable quality and cost-effectiveness.

Methods

We searched MEDLINE and Cinahl for English language articles published before November 2006, without limits, combining the search terms nurse practitioner or NP, RN or Nurse, extended or advanced practice, and emergency. This search retrieved 558 articles, of which 281 were selected manually for further review on the basis of the relevance of the abstract. Of these, 59 articles met inclusion criteria and were assessed for quality. We also performed a hand search of references for the included papers. Review articles were read for their reference lists. Any missing articles were retrieved and assessed.

Articles were included if they discussed NPs by training or appellation who worked in the ED setting and if they addressed 1 of the 4 a priori determined outcomes of interest: cost, quality, wait times and patient satisfaction. Articles could address any combination of adult and pediatric patients and did not have to be a direct comparison between NPs and another health care provider. For qualitative and correlational studies, we assessed methodologic quality using a tool developed and previously published by Estabrooks and colleagues,¹⁷ which is shown in Table 1.

Good quality was defined as a score of more than 4 points. Randomized controlled trials were assessed using the Jadad score, for which good quality was defined as a score of 3 or more. Scoring of these trials is shown in Table 2. Articles were excluded if they were found to be of poor quality or if they failed to meet inclusion criteria on detailed review. Ultimately, 36 papers were included in the analysis. A second author independently reviewed the articles for appropriateness of inclusion and extracted data. The included papers are summarized in Table 3.

Results

Cost-effectiveness

A complete summary of the results by outcome measure can

Table 1. Summary of quality assessment (qualitative and correlational studies)

Summary of quality assessment (<i>n</i> = 33)	Studies, <i>n</i>	
	Yes	No
Design		
Prospective studies	25	8
Used probability sampling	5	28
Sample		
Appropriate or justified sample size	3	30
Sample drawn from more than one site	6	27
Anonymity protected	32	1
Response rate > 60%	33	0
Measurement		
Reliable measure of effect	32	1
Effect of sufficient magnitude to be measured	33	0
Effect measured rather than self reported (score 2 points)	28	5
Internal consistency ≥ 70% when scale used	4	29
Theoretical model/framework used	6	27
Statistical analysis		
Correlations analyzed when multiple effected studied	0	33
Management of outliers addressed	1	32

be found in Table 4. Principal themes are highlighted in the following paragraphs. The ability to ration resources through clinical decision rules such as the Ottawa Ankle Rule was the same or better for NPs, compared with residents. Sakr and colleagues¹⁸ showed no difference between NPs and residents in terms of the rates at which they asked for advice or in terms of the scheduling of follow-up, although there was more unplanned follow-up in the resident group (8.6% v. 13.1%, respectively; $p = 0.03$). Overall cost, however, appeared to be higher for NP care. Some of the studies, such as Sakr and colleagues¹⁹ cost per workload unit, did make an attempt to factor in more than the salary, although it is unknown whether the hidden training costs of residents were included. They calculated a revenue cost per workload unit of £41.4 in the minor injury unit and £40.01 in the ED. After factoring in the cost of a higher rate of scheduled follow-up (47% v. 27%), they found a cost consequence of £12.7 in the minor injury unit, compared with £9.66 in the ED.¹⁸ Another cost calculation, this time per hour, also found that the NP was slightly more expensive than the senior house officers, who would be the traditional care provider in the UK ED (the NP cost £12.18 hourly for daytime work, £15.81 for evening and Saturdays, and £19.44 on Sundays, while residents always cost £14.91 hourly).¹⁹ These studies did not compare NPs to attending physicians.

Quality of care

Several of the studies looking at quality of care examined the accuracy of x-ray interpretation. Resident physicians and NPs were found to be equally competent, with a trend toward greater accuracy with more experience, regardless of profession (area under receiver operating characteristic curve 83.4% for experienced residents, 79.7% for NPs and 75.6% for inexperienced residents).²⁰ An Australian randomized control trial by Chang and colleagues examined a rural isolated ED, with satisfaction assessed by phone follow-up and outcome by blinded follow-up. Protocol was followed by the NP for all cases.²¹ Documentation, accu-

Table 2. Summary of quality assessment (randomized controlled trials)

Summary of quality assessment, <i>n</i> = 3	Studies, <i>n</i>	
	Yes	No
Was the study described as randomized?	3	0
Was the method used to generate randomization described and appropriate?	3	0
Was the study described as double blind?	0	3
Was the method of double blinding described and appropriate?	0	3
Was there a description of withdrawals and dropouts?	3	0
Deduct one point if the method used to generate randomization was described and inappropriate.	—	—
Deduct one point if the study was described as double blind but the method was inappropriate.	—	—

— = not applicable.

racy of physical exam and appropriateness of urgent referrals were higher for the NPs.

Patient satisfaction

Patient satisfaction was consistently high for both NPs and residents, but was often higher for NPs. For instance, 77% of the NPs' patients were completely satisfied, compared with only 48% of the residents' patients; however, NPs and

residents did not differ in terms of overall patient satisfaction, which was good for both. Patient satisfaction was based on quality of care, which was equal between the NPs and the resident, and how well the NPs explained the procedures, which was better than physicians (14.3% for NPs, compared with 6.1% for residents). Reasons for patient dissatisfaction were unresolved problems (66% for NPs v. 26.7% for residents) and slow time to care by residents

Table 3. Characteristics of included studies

Study, country of study	Study question	Study design	Study subjects
Considine et al, ²⁹ Australia	NP scope of practice; use of protocols; resources	Cohort	476 patients
Blunt, ²⁶ US	Role; productivity; cost-effectiveness	Case control	6 attending physicians; 2 NPs, 51 residents over 1 year of patients (about 18 000 patients)
Cole, ³⁷ US	Scope of practice; resource use	Cohort	3 NPs; 279 patients
Walrath et al, ³³ US	Satisfaction; productivity before and after staffing change	Case control	400 patients
Dolan, ³⁰ UK	Scope; resource use; productivity	Cohort	3 sites; about 1000 patients per site; NP number unknown
Tachakra and Stinson, ²⁵ UK	Feasibility assessment for NPs to see patients in major ED; estimate of wait time savings	Cohort	1591 patient encounters
Sakr et al, ¹⁸ UK	Cost; wait time; quality of NP-staffed MIU v. traditional ED	Case control	1313 cases; 1447 control patients
Heaney and Paxton, ³¹ Scotland	Wait time; quality and cost for patients in NP-staffed MIU	Cohort	364 patients for referral; 810 for documentation; 20 000 patients for wait times and cost
Byrne et al, ³⁸ UK	Traditional ED v. NP-staffed MIU in ED v. NP-staffed free-standing MIU, looking at wait times (satisfaction reported separately, see Byrne et al ⁵¹)	Case control	57 patients in NP-staffed unit in ED; 67 in free-standing unit; 57 controls
Mabrook and Dale, ³⁹ UK	Use of resources, including consultation, radiographs and satisfaction	Cohort	6944 patient encounters
Mann et al, ⁴⁰ UK	Ability of NP v. resident to use Ottawa Ankle Rules	Case control	1365 patients by NP, 700 by resident
Meek et al, ⁴¹ UK	Ability of NP v. resident to interpret limb radiograph	Case control	20 radiographs each at 13 EDs; 58 NPs; 3 experienced residents; 41 inexperienced residents
Overton Brown and Anthony, ²⁰ UK	Using receiver operating characteristic, compare NP with resident interpretation of extremity radiographs	Case control	7 NPs, 7 residents with experience in ED, 7 residents at beginning of ED rotation, same 50 radiographs each
Marshall et al, ⁴² UK	Safety and ability to prescribe within protocol	Cohort	2925 patients; 455 who received medications
Morris et al, ⁴³ UK	Triage decision of NP v. senior resident	Case control	522 patients
Kirkwood et al, ⁴⁴ Australia	Quality of care by NP-diagnosis; treatment plan	Cohort	259 patients
Freij et al, ⁴⁵ UK	NP v. resident ability to interpret radiographs	Case control	150 cases; 150 controls
Sakr et al, ¹⁹ UK	Quality of care by NP v. resident; documentation; rate of error; use of resources	RCT	704 patients assigned to NP; 749 to resident

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(33.3% for NPs v. 53.3% for residents).²² Moser found that of 213 patients surveyed, 72.5% said that they would be willing to see an NP, although 21% of those people also expected to see a staff physician. Of the 12.1% who were unwilling to see an NP, 36% said they would never be willing and 81.2% said they would see an NP only if they had a different problem. Twenty-five percent said that they would see an NP if it would result in cost savings to the health care system, and 37.5% said they would agree, if it would result in shorter ED wait times.²³

Wait times

Data show that with the addition of an NP, whether in a minor injury unit in the ED or in a free standing unit, wait times are reduced. The studies do not compare the addition of an NP with the addition of any other staff (e.g., more residents, another attending physician or a physician's assistant). In a UK "see and treat" model, the average wait time to see a practitioner dropped from 56 to 30 minutes, the average time in the department decreased from 1 hour and 39 minutes to 1 hour and

Table 3. continued

Powers et al, ²² US	Patient knowledge, satisfaction and compliance	Case control	31 patients by NP; 31 by resident
Chang et al, ²¹ Australia	Quality of care by NP v. resident medical officer for wounds and limb injury	RCT	169 patients; 4 NPs
Cooper et al, ⁴⁶ Scotland	Satisfaction with NP care v. resident care; quality of documentation	RCT	199 patients
Banerjee et al, ⁴⁷ UK	Appropriateness of triage decisions; diagnostic accuracy by NP	Case control	301 patients seen by NP then by physician
Ezra et al, ⁴⁸ UK	Accuracy of physical exam and appropriateness of referral from ED by NP v. resident	Case control	36 resident patients; 20 NP patients
Allerston and Justham, ⁴⁹ UK	Application of ankle rule by NP; transit time in ED	Case control	79 cases; 104 controls
Forgeron and Martin-Misener, ⁵⁰ Canada	Willingness to see NP; factors affecting willingness	Survey	100 parents of pediatric patients
Byrne et al, ⁵¹ UK	Satisfaction aspect of earlier Byrne study ³⁸ (ED v. NP unit in ED v. free standing NP unit)	Survey	57 patients in NP unit in ED; 67 in free standing NP unit; 57 in traditional ED
Alongi et al, ³⁵ US	Patient and physician satisfaction with NP quality of care	Survey	50 patients; 90 physicians
Rhee and Dermeyer, ⁵² US	Satisfaction with NP v. physician care (resident plus attending)	Survey	30 NP patients; 30 physician patients
Moser, ²³ Canada	Attitude of ED patients toward NPs	Survey	213 patients
Barr et al, ⁵³ UK	Patient satisfaction; review of x-rays	Survey	241 patients; 85 x-rays from NP and 85 from resident
Megahy and Lloyd, ⁵⁴ Scotland	Patient satisfaction; appropriateness of referral; accuracy of x-ray interpretation	Survey	181 patients for satisfaction; 367 x-rays; 93 clinic referral audits
Tachakra and Deboo, ³² UK	Productivity, quality of history, exam, radiology interpretation and treatment of NP v. SHO	Case control	200 cases; 200 controls
Dowling and Dudley, ¹ US	Wait times pre and post opening of an NP-staffed fast track	Case control	3157 patients
James and Pyrgos, ⁴ UK	Treatment provided by resident v. NP; wait time; satisfaction	Case control	400 patients; 4 NPs; 6 residents
Winston, ³⁴ US	Comparison of wait times before and after NPs implemented	Survey	85 patients
Rogers et al, ²⁴ UK	Wait time for patients seen by NP-MD see and treat team	Case control	70% of Category 4 patients (no number given)
Considine et al, ⁵⁵ Australia	Wait times for NP patients v. traditional ED	Case control	102 NP patients; 623 controls

NP = nurse practitioner; MIU = minor injuries unit; ED = emergency department; RCT = randomized controlled trial; SHO = senior house officer.

Table 4. Findings of included studies

Outcome	Study	Finding
Cost		
Same or higher for NP	Considine et al ⁵⁵	No difference in number of x-rays ordered, $p = 0.463$; NP sees 1–2 patients hourly
Same or higher for NP	Blunt ²⁶	Similar volume seen by NP and resident but acuity not the same (not a breakdown of hourly patients per provider)
Same or higher for NP	Cole and Ramirez ³⁷	NP unit ordered fewer tests per patient, but patients were lower acuity
Same or higher for NP	Tachakra and Deboo ³²	Ordering of radiology equal in numbers; NP sees 1–2 patients hourly
Higher for NP	Walrath et al ³³	Able to increase from 7.85 patients per provider seen in 8 hr to 10.8
Higher for NP	Sakr et al ¹⁸	More scheduled follow-up by NPs; higher cost
Higher for NP	Sakr et al ¹⁹	More unplanned follow up by residents; higher hourly cost for NP v. residents
Higher for NP	Heaney and Paxton ³¹	Cost per patient £33 in MIU (high); NP sees average of 1–2 patients hourly
Not stated	Dolan ³⁰	Staff salary divided by number of patients seen at cost of £10.56–£30.51
Higher for NP	James and Pyrgos ⁴	NPs ordered x-rays for 22 more patients than did residents; none had positive result
Quality		
Same or higher for NP	Heaney and Paxton ³¹	88% of NP referrals, 99% of dispositions appropriate and 98% of notes “satisfactory or very satisfactory”
Good quality (not directly compared)	Mabrook and Dale ³⁹	Low rate of missed fracture or false positive (22/1945 and 57/1945 patients)
Same or higher for NP	Mann et al ⁴⁰	Able to accurately use Ottawa Ankle Rule equal to resident (sensitivity 0.98 for both; specificity 0.32 NP v. 0.28 resident)
Same or higher for NP	Meek et al ⁴¹	NPs better at x-ray interpretation than inexperienced residents, though experienced residents did slightly better
Same	Overton Brown and Anthony ²⁰	No difference in accuracy of x-ray interpretation; trend toward greater accuracy with experience regardless of profession
Good quality (not directly compared)	Marshall et al ⁴²	No breach of medication administration protocol
Same	Morris et al ⁴³	NP triage 92% correct v. resident; treatment plan 88% with no ill effects for disagreements
Same	Kirkwood et al ⁴⁴	100% correct diagnosis by NP; 95.2% agreed with management
Same	Freij et al ⁴⁵	No difference in sensitivity of interpretation of x-rays for NP v. resident (93.2% v. 92.5%)
Same	Sakr et al ¹⁹	No difference in NP v. resident to request or interpret x-ray
Same or higher for NP	Sakr et al ¹⁸	Higher rate of process errors in traditional ED v. NP-run MIU, $p = 0.003$; no difference in outcome at 28 d, in radiology request or in accuracy
Same	Powers et al ²²	Equal recall of health recommendations; better understanding of medications for residents patients; better understanding of activity, exercise and procedures for NP patients; equal compliance with short-term recommendations; better long-term for residents’ patients (78.1% v. 63.3%); equal resolution of health problem
Same	Chang et al ²¹	Outcome at follow-up was 7–10 on scale of 10 (though some were patients of NP and some were of residents); NPs followed protocol in all cases
Same or higher for NP	Cooper et al ⁴⁶	Better documentation by NPs; no difference in recovery, follow-up or missed injuries (not powered for this)
Good quality (not directly compared)	Banerjee et al ⁴⁷	Triage 100%; diagnosis 100%; plan 96%
Same	Barr et al ⁵³	Equal false-positive and negative x-ray reads compared with resident
Higher for NP	Ezra et al ⁴⁸	NPs more accurate at visual acuity measurement, diagnosis and appropriateness of urgent referral ($p = 0.027$)
Same or higher for NP	Allerston and Justham ⁴⁹	Able to accurately use Ottawa Ankle Rule

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17 minutes, and the wait time for all patients in the department was lower after the introduction of this model.²⁴ Most studies examined NPs in minor treatment areas;

however, 2 studies (Tachakra and Stinson²⁵ and Blunt²⁶) suggested that NPs could also reduce wait times by seeing higher acuity patients.

Table 4. continued

Same or higher for NP	Tachakra and Deboo ³²	NP equivalent to resident for history taking, exam, diagnosis and investigations; significantly better documentation ($p < 0.001$)
Same	James and Pyrgos ⁴	Only 3% disagreement in cases managed by resident v. NP
Same	Megahy and Lloyd ⁵⁴	100% of x-rays ordered appropriately; 98% correct interpretation; high documentation scores
Poor quality (not directly compared)	Alongi et al ³⁵	Supervising physician believed exam good in 35% of NP cases; clinical judgment good 30%; clinical performance good in 70% of nonurgent and 40% of urgent cases
Satisfaction		
Higher for NP	Byrne et al ⁵¹	Better communication; able to fully discuss problems; better instructions
Higher for NP	Powers et al ²²	NP patients had better understanding of recommendations and therapy; residents' patients better with medications, diet, fluids; 74% NP patients completely satisfied v. 48% residents' patients; willing to see NP again
Same	Chang et al ²¹	No difference in satisfaction v. resident on 5 point scale; willing to see NP again
Higher for NP	Cooper et al ⁴⁶	NP easier to talk to than resident ($p = 0.009$); more info about accident and illness prevention ($p = 0.001$) and patients' injuries ($p = 0.007$)
Good satisfaction (not directly compared)	Forgeron and Martin-Misener ⁵⁰	83% of parents of pediatric patients would be willing to see NP for current complaint
Higher for NP	Byrne et al ⁵¹	Better discharge instructions, written information and health advice; willing to see NP again
Good satisfaction (not directly compared)	Alongi et al ³⁵	Patients felt exam was "good" in 92% of cases; > 90% would see NP again for same problem
Same	Rhee and Dermeyer ⁵²	High satisfaction for both (3.9/5 for NP and 4.0/5 for resident)
Good (not directly compared)	Moser ²³	72.5% willing to see NP for the problem they had, but 21% also want to see a physician
Good (not directly compared)	Barr et al ⁵³	> 80% willing to see NP again
Higher for NP	Megahy and Lloyd ⁵⁴	Better communication, better instructions
Good satisfaction (not directly compared)	James and Pyrgos ⁴	94% would see NP
Wait time		
Decreased for NP	Byrne et al ⁵¹	Standard ED care v. NP care within ED in minor treatment unit v. separate MIU: wait time 67 min in ED, 33.6 in dedicated minor area, 23.1 in MIU ($p < 0.001$) and shorter length of stay (ED, 101.7 min; minor area, 85.6 min; MIU, 56 min; $p < 0.001$ for ED v. either area)
Decreased for NP	Barr et al ⁵³	Wait time to see NP was 22 min and 86 min to see physician
Decreased for NP	Tachakra and Deboo ³²	17.75% of major side patients could theoretically have been seen by NP while minor area was slow
Decreased for NP	James and Pyrgos ⁴	11 minute theoretical time savings if NP care had been implemented
Same	Winston ³⁴	Average length of stay before and after program introduction was 3.067 hr and 3.01 hr; volume of department increased 37%; walkouts decreased by 12.5%
Decreased for NP	Sakr et al ¹⁸	Wait time reduction from 56.4 min in traditional ED to 10 min in NP-run MIU, $p < 0.0001$; total length of stay down to 51.5 min from 95.4 min, $p < 0.0001$
Decreased for NP	Rogers et al ²⁴	Average wait time to see practitioner decreased from 56–30 min; average length of stay decreased from 99 min to 77 min; wait time for all patients in department decreased
Same	Considine et al ⁵⁵	No difference in wait time or length of stay for patients in the minor ED whether seen by resident or NP

NP = nurse practitioner; MIU = minor injury unit; ED = emergency department.

Discussion

When assessing the potential benefits of an NP in the ED, primary outcome measures should include his or her impact on wait times, patient satisfaction, quality of care and cost-effectiveness. Further, it is important to consider the study's country of origin when interpreting the results. The UK and Australian systems provide much of their emergency care using senior house officers, whose positions would be about equivalent to North American mid-level residents. This is not the standard in Canada or in the United States, where patients may initially be seen by a resident, but are always directly overseen by a staff physician. Such oversight makes direct comparisons between NPs and residents much more difficult. The cost-benefit ratio, which may depend on the practice setting, is another factor to consider. To date, most of the reviewed papers focused on NPs in a minor injury or fast track setting.

Overall, NPs appear to be more expensive than residents, on a per patient basis. Attending physicians are paid significantly more than NPs, who in turn are better paid than residents^{10,27} and nurses. However, there are training costs to a residency program beyond the salary and it is unclear how much this was a factor in the analyses. The additional cost of having a nurse in the treatment area is offset in some of the systems by having the NP carry out the nursing treatment as well.^{10,28} Holistic care, or having the same health care provider during the entire ED visit, is advocated by some to improve the recognition of potential complications and a patient's knowledge of self-care or symptom management¹¹ to better manage compounding psychosocial factors. However, it may contribute to lower volumes of patients seen. The best evidence we have suggests that NPs will see between 1 and 2 patients per hour.²⁹⁻³² The accepted target for the staff emergency physician is 3 (to 4) patients per hour.¹ One NP group was able to raise their volume from 7.85 patients per provider per 8 hour day before study, to 10.8 patients per 8 hour day by giving up breaks, no longer assisting with staff orientation or going to lecture and by implementing incentives,³³ but the desirability of this solution is questionable. The lack of volume seen by the NP may relate to restrictive protocols and staffing issues or to the speed at which the NP works. It may well be that the act of reducing patient numbers seen by physicians through increasing the workload of the nursing staff may not improve patient flow. In terms of economics for the hospital, failure of insurance companies to reimburse for patient care unless the patient is seen by a physician may be another barrier to NP service.³⁴

Further data are required on the cost-effectiveness of

NPs, compared with emergency physicians in a variety of settings. In high volume, low acuity areas, NPs may be more cost effective than in lower volume, high acuity departments, where additional physician resources may be able to manage a wider variety of patients. In the low volume setting, such as the small community or particularly the rural ED, where physician shortages have led to reduction of hours or full closure of the department, NPs could prove an invaluable resource, both to overextended rural physicians and to the rural communities. However, hard data are lacking in this setting.

Quality of care is another important consideration. Quality can be judged against many standards. The NPs did equally well at x-ray interpretation and were better at documentation and following protocols when compared with the residents. The only negative study is a 1979 study that asked staff physicians to judge the performance of NPs.³⁵ Of note, in this same study, patients were very satisfied. Quality was also judged on the appropriateness of referrals, for which the NPs also fared better. This is one way in which adding an NP to the minor treatment area will be just as good, if not better, than adding another resident. To date there is little comparative data looking at specific patient outcomes. Attending physicians have judged NP care to be appropriate. Such subjective assessment has been within the context of NPs functioning within defined protocols. A meta-analysis of these various studies would be difficult because of the heterogeneity of these systems, but it is reassuring that the rate of misses appears low.

The additional patient contact time afforded by the NP encounter, along with improved communication and shorter length of stay, appear to translate into greater patient satisfaction. Patients are, overall, very satisfied with NP care, which is one of the value added features of having NPs in the ED. Patients receive more health information and better discharge instructions.

In the US health care model, one of the key customer service measures, and one of the main advertising catch phrases, is wait time. Minor injury patients represent a significant portion of ED visits. Because of the triage system, these people have historically waited the longest. Many EDs are employing NPs to help achieve new wait time benchmarks, assuming they are more cost effective than adding board certified physicians to treat this category of patients.¹ The addition of an NP to the ED or to a free standing unit did reduce wait times for the low acuity patients. There is little data on the impact of this streaming on the remainder of the department.

One may argue that many of these studies merely support the presence of a fast track service. This then raises

the question of whether increasing dedicated physician staff in fast track areas, through some combination of residents and staff physicians, could reduce wait times even more effectively than with NPs. Studies looking at the overall throughput of departments in these 2 scenarios are lacking. Given the current lack of physician resources, this discussion is probably moot.

Factors impeding the implementation of the NP role must be examined and are thought to include funding, lack of medical support, medico-legal concerns and lack of nursing support. Consideration should be given to how to best use NPs in academic centres, where other priorities, including resident training, may require residents to see lower acuity patients. It remains to be determined how great an impact expansion of the NP role will have on nursing resources, which, in Canada, are even more strained than physician resources. There are concerns in the nursing community that NPs will be seen as a “cheap doctor substitute” instead of offering a “value added service” in terms of health promotion and communication skills. This shift could devalue ED nursing¹² and the unique nature of nursing could be lost, subsumed by a desire to cure rather than care.³⁶

Conclusion

In an attempt to address the growing ED population in the context of a limited medical workforce, NPs have been presented as a staffing option. The results of this review suggest that the addition of a staff member dedicated to seeing minor treatment patients will improve wait times for these patients as well as improve patient satisfaction, with little or no impact on quality of care. For the low acuity patients in overcrowded urban EDs and in the setting of rural ED, NPs may represent a viable and effective option, allowing optimal use of limited physician resources and improving access to emergency care for the population.

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