



Emergency nurse practitioner care and emergency department patient flow: Case-control study

Julie Considine, Roslyn Martin, DeVilliers Smit, Craig Winter and Jane Jenkins
Emergency Department, The Northern Hospital, Epping, Victoria, Australia

Abstract

- Objective:** The present study aimed to compare ED waiting times (for medical assessment and treatment), treatment times and length of stay (LOS) for patients managed by an emergency nurse practitioner candidate (ENPC) with patients managed via traditional ED care.
- Methods:** A case-control design was used. Patients were selected using the three most common ED discharge diagnoses for ENPC managed patients: hand/wrist wounds, hand/wrist fractures and removal of plaster of Paris. The ENPC group ($n = 102$) consisted of patients managed by the ENPC who had ED discharge diagnoses as mentioned above. The control group ($n = 623$) consisted of patients with the same ED discharge diagnoses who were managed via traditional ED care.
- Results:** There were no significant differences in median waiting times, treatment times and ED LOS between ENPC managed patients and patients managed via traditional ED processes. There appeared to be some variability between diagnostic subgroups in terms of treatment times and ED LOS.
- Conclusion:** Patient flow outcomes for ENPC managed patients are comparable with those of patients managed via usual ED processes.
- Key words:** *emergency, nursing, length of stay, nurse practitioner, research.*

Introduction

Although emergency nurse practitioners (ENP) have been utilized in both the United Kingdom and the United States for more than 2 decades,^{1–3} the role of the

ENP is relatively new in Australia.^{4,5} In the state of Victoria, a Nurse Practitioner is defined as '... a registered nurse educated for advanced practice who is an essential member of an interdependent health care team and whose role is determined by the context in which

Correspondence: Ms Julie Considine, Emergency Department, The Northern Hospital, 185 Cooper St, Epping, Vic. 3076, Australia. Email: julie.considine@nh.org.au

Julie Considine, RN, RM, BN, CertAcuteCareNsg(Emerg), GradDipNsg(Acute Care), MN, FRCNA, Project Officer; Roslyn Martin, RN, RM, EmergCert, GradDipCritCare, GradDipMid, Emergency Nurse Practitioner Candidate; DeVilliers Smit, MBChB, FACEM, Emergency Physician; Craig Winter, MB, MS, FACEM, GMQ, MBA, Director of Emergency Medicine; Jane Jenkins, RN, EmergCert, BHSc(Nsg), Emergency Department Nurse Unit Manager.

s/he practices.^{16,7} The title 'Nurse Practitioner' is protected by legislation and an amendment to the Nurses Act 1993 (Victoria) prevents use of the title by persons who have not met the requirements of the Nurses Board of Victoria (NBV).^{8,9} Nurses who are working towards endorsement as a Nurse Practitioner are therefore referred to as Nurse Practitioner Candidates (NPC). The ENP role extends current advanced emergency nursing practice, and may include prescribing medications, initiating diagnostic imaging and pathology testing, approving absence from work certificates, referring to specialists and admitting and discharging patients.

Implementation of the ENP role in the ED at The Northern Hospital (TNH), Epping, New Hampshire occurred as part of the Victorian Department of Human Services (DHS) funded ENP project. The key aim of this initiative was to establish the ENP model as an effective and sustainable model of care delivery in Victorian ED. Nine ED and thirteen emergency nurse practitioner candidate (ENPC) are currently participating in this project and this is the largest group of NPC from the one speciality in Australia to date.

The ENP model of care at TNH was a collaborative model that focused on the management of minor illness and injury. One full time ENPC managed specific patient groups in collaboration with emergency physicians. The adult presentations eligible for ENPC management were: laceration and wounds, forearm/wrist injury, lower leg/ankle injury, hand injury, symptoms suggestive of cellulitis, foot injury, knee injury, calf pain suggestive of deep vein thrombosis, elbow injury, plaster of Paris (POP) complication, vomiting in pregnancy (hyperemesis), symptoms suggestive of urinary tract infection/pyelonephritis, vomiting and diarrhoea, minor burns, breast pain and inflammation suggestive of mastitis, loin pain suggestive of renal colic and viral symptoms suggestive of upper respiratory tract infection. The paediatric presentations eligible for ENPC management were: lower limb injury or non-use, upper limb injury or non-use, laceration and wounds, POP complication, vomiting and diarrhoea, minor burns and viral symptoms suggestive of upper respiratory tract infection.

System outcomes of ENP care are not well defined. International research literature regarding the ENP role has, to date, focused on outcomes such as patient satisfaction,^{1-4,10-14} waiting times and/or ED length of stay (LOS),^{3,10,12,15} accuracy and adequacy of documentation,^{14,16} use of radiography¹⁷⁻²⁰ and patient education, health promotion and communication issues.^{2,10,13,14,21}

There is a paucity of literature related to specific patient flow outcomes therefore the true contribution of ENP to patient flow processes in the ED is not well understood. The purpose of the present study was to compare ED waiting times, treatment times and LOS for ENPC managed patients with patients managed via traditional ED care with the view to providing exploratory data about the effect of ENP care on patient flow through the ED.

Methods

A case-control design was used to compare waiting times, treatment times and ED LOS of ENPC managed patients with those of patients managed by traditional ED care. TNH is the only acute care campus of Northern Health and is located approximately 30 km north of Melbourne. During 2004, the ED at TNH treated in excess of 60 000 patients. The admission rate was 29% and approximately 25% of presentations were paediatric. The study period extended from July 14 2004 to March 31 2005. For the purposes of the present paper, the following definitions were used:

1. ED waiting time was defined as the difference between arrival time and time of initial medical [*or ENPC*] assessment.²²
2. Treatment time was defined as the difference between time of medical [*or ENPC*] assessment and departure time.²²
3. ED LOS was defined as the difference between arrival time and departure time.²²

In Australia, ED discharge diagnoses are classified using the ICD-10-AM (Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification).²³ The three most common ED discharge diagnoses for ENPC managed patients were as follows: open wound (hand/wrist) (ICD-10 – S619), fracture (hand/wrist) (ICD-10 – S628) and removal of orthopaedic device, typically POP (ICD-10 – Z478). These diagnostic subgroups form the basis for the case-control analysis.

The inclusion criteria for the ENPC group were all patients: (i) with an ED discharge diagnosis of hand/wrist wound, hand/wrist fracture or removal of POP; (ii) discharged from the ED; and (iii) managed by the ENPC during the data collection period. The inclusion criteria for the control group were the same but only included those who presented from Monday to Friday and were seen between 8.00 and 22.30 hours. Congruent with usual ED practice, patients were allocated to ENPC

care or traditional ED care on the basis of staff availability. When the ENPC was available, patients that met ENPC management criteria were allocated to ENPC care. When the ENPC was unavailable because of workload, rosters or other commitments, patients were managed via traditional ED care. Waiting times, treatment times and ED LOS were extracted from the Hospro™ (Vital) Emergency Department Information System (Trakhealth, Sydney, NSW, Australia).

There were two reasons for excluding patients seen on weekends and overnight. First, the ENPC was only rostered to shifts from Monday to Friday within the hours of 8.00 and 23.00. These were the times when emergency physician staffing was optimal, ensuring safe practice and adequate clinical support for the ENPC. Second, the triage Rapid Assessment Team (RAT) does not operate overnight. The RAT consists of an emergency physician and emergency nurse and assesses all patients following the triage process. The aim of the RAT is to augment the care provided at triage by assessing the patient's clinical status, attending to pain relief needs and facilitating initial management requirements and investigations. Audits of the RAT at TNH have shown that the RAT significantly decreased waiting time, treatment time and ED LOS.

Currently there are no guidelines related to clinically significant reductions in waiting time or ED LOS. In an attempt to ascertain the sampling requirements for statistical power, data from all patients in the present study ($n = 725$) showed the mean waiting time was 12.33 min (SD = 24.68) and the mean ED LOS was 156.86 min (SD = 126.32). Using sample size tables for two sample t -test, a significance level of 0.05 (2 sided) and power of 0.80, at least 99 patients in each group would be required to detect a mean difference of 5 min in waiting times and 64 patients in each group would be required to detect a mean difference of 60 min in ED LOS.²⁴

Data were not normally distributed so median times and ranges are presented and non-parametric tests (Mann–Whitney U -test and χ^2 -test) were used to compare control and ENPC groups.^{25–27} Data analyses were performed using the computer software SPSS for Windows 14.0® (SPSS, Chicago, IL, USA). The Human Research and Ethics Committee (HREC) at TNH were informed of the strategies to be used to evaluate of the ENPC model of care. The HREC gave in principle agreement to all evaluation strategies including assessment of patient flow but because the focus of the present study was evaluation of a new model of care, full HREC application was not sought.

Table 1. Study participants: ATS categories and diagnostic subgroups

	Control group <i>n</i> (%)	ENPC group <i>n</i> (%)	<i>P</i> -value*
ATS category			
Category 2	2 (0.4)	0 (0.0)	1.000**
Category 3	20 (3.2)	4 (3.9)	0.76**
Category 4	331 (53.1)	62 (60.8)	0.15
Category 5	270 (43.3)	36 (35.3)	0.13
Diagnostic subgroups			
Hand/wrist wound	202 (32.0)	30 (29.5)	0.55
Hand/wrist fracture	218 (35.0)	51 (50.0)	0.004
Removal POP	203 (33.0)	21 (20.5)	0.015

* χ^2 -test; **Exact. ATS, Australasian Triage Scale; ENPC, emergency nurse practitioner candidate; POP, plaster of Paris.

Results

In total, 725 patients were included in the study. The median age was 24 years (range 1–91) for the control group and 28 years (range 3–78) for the ENPC group ($P = 0.440$). There were significant differences in Australasian Triage Scale²⁸ categories between two groups (Table 1). When diagnostic subgroups were examined, the ENPC group had a significantly higher proportion of patients with hand/wrist fractures and lower proportion of patients requiring POP removal.

Comparisons of waiting times, treatment times and ED LOS are presented in Table 2. Median waiting times were the same for both the ENPC and control groups. There were no significant differences in median treatment times and ED LOS. The median treatment times for the control and ENPC groups were similar ($P = 0.41$). However, the ENPC treatment time for removal of POP was longer than the control group. The median ED LOS for the control and ENPC groups were also similar. Again, however, there were differences between the groups for the different procedures undertaken.

Discussion

In the present study, there were no significant differences between the control and ENPC managed patients in the three times examined. Median waiting time was the same for both groups. The short waiting times are reflective of the RAT system that augments the care provided at triage at TNH. Approximately 60–70% of ED patients are seen by the RAT emergency physician

Table 2. Waiting times, treatment times and ED length of stay (min) per group

	Control group Median (range)	ENPC group Median (range)	<i>P</i> -value*
Waiting times			
Hand/wrist wound	5.0 (0–179)	7.0 (0–140)	
Hand/wrist fracture	4.0 (0–355)	3.5 (0–42)	
Removal POP	4.0 (1–124)	4.0 (0–17)	
Group total	4.0 (0–355)	4.0 (0–140)	0.96
Treatment times			
Hand/wrist wound	114.0 (2–311)	114.0 (11–231)	
Hand/wrist fracture	144.0 (8–1239)	117.0 (12–491)	
Removal POP	103.0 (2–765)	141.0 (13–261)	
Group total	124.0 (2–1239)	118.0 (11–491)	0.41
ED length of stay			
Hand/wrist wound	127.0 (8–311)	123.5 (17–250)	
Hand/wrist fracture	156.0 (9–1264)	125.0 (14–495)	
Removal POP	114.0 (5–769)	148.0 (14–262)	
Group total	137.0 (5–1264)	125.5 (14–495)	0.28

**Mann–Whitney U*. ENPC, emergency nurse practitioner candidate; POP, plaster of Paris.

prior to being assigned to the ENPC or traditional ED care so the RAT system does distort waiting time data. A deliberate decision was made to include waiting time data as the RAT process was applicable to both patient groups (ENPC and control) and it was important to ascertain if ENPC managed patients were disadvantaged by prolonged waiting times or reduced incidence of RAT consultation prior to ENPC care. The results of the present study suggest that ENPC care does not disadvantage patients in terms of waiting time or time spent in the ED.

There is a lack of case–control studies evaluating patient flow outcomes of ENP care. Although other studies have evaluated patient flow outcomes of ENP care, case–control designs are not common. Many researchers report decreased waiting times^{10,12,15,29} and reductions in ED LOS^{10,29} as positive outcomes of ENP models of care. A number of these studies had significant methodological limitations and therefore the conclusions that may be drawn are limited. Common methodological issues included small sample sizes, lack of detail about patient characteristics such as age, triage category, nature of presenting problem, ED discharge diagnosis or disposition details and a lack of case–control designs.

One of the few well-designed, case–control studies examining patient flow and ENP was conducted by Allerston and Justham.²⁹ They examined treatment time and ED LOS of patients presenting to the ED with ankle injuries. The control group were triaged via usual processes and waited to be assessed by a doctor or ENP before diagnostic imaging was initiated. The experimen-

tal group were assessed by an ENP at triage. The ENP used the Ottawa ankle rules to ascertain the need for diagnostic imaging and, if indicated, X-rays were initiated as part of the triage process. Patients in the experimental group had significantly shorter average treatment times (73.59 *vs* 98.52 min, $P = 0.001$) and ED LOS (81.25 *vs* 106.59 min, $P = 0.001$).²⁹ Unfortunately, the present study has limited applicability to the study reported in the present paper as it compared two different processes for initiation of diagnostic imaging rather than the effect of different roles on the same process.²⁹

Descriptive data from the present study suggest there might be variability in treatment times and ED LOS between diagnostic subgroups. Because the sample sizes of subgroups were small, it was inappropriate to perform statistical comparisons and research with larger subgroups samples is warranted. However, these data highlight some interesting trends. For example, ENPC patients with hand/wrist fractures appeared to have shorter treatment times and ED LOS than control group patients. Conversely, for patients requiring POP removal, ENPC managed patients had longer treatment times and ED LOS.

One possible explanation is that these findings were reflective of differences in subgroup composition as the ENPC group had a significantly higher proportion of patients with hand/wrist fractures and lower proportion of patients requiring POP removal. If this was the case, then it may be proposed that patients with hand/wrist fractures are more efficiently treated by the ENPC than patients requiring POP removal. Given that all

patients in the present study were discharged from the ED, it is reasonable to assume that the majority of patients with hand/wrist fractures left the ED with a POP. The shorter treatment times and ED LOS therefore might be attributed to the ENPC managing all aspects of patient care, including POP application. In contrast, it is common practice for patients managed by ED medical staff to have POP application delegated to ancillary personnel such as nursing attendants and this may be a factor in longer treatment times and ED LOS for control group patients with hand/wrist fractures. If a holistic approach to patient care is a factor in reducing treatment times and ED LOS for patients with hand/wrist fractures then it should be expected that treatment times and ED LOS would be similar in patients requiring POP removal. In the present study, treatment times and ED LOS were longer for ENPC managed patients requiring POP removal. The counter-intuitive nature of the findings related to these patient subgroups highlights the need for further research.

Variability between the patient groups raises questions about the isolated use of patient flow outcomes to measure the effectiveness of ENPC care. Tye cautions that the use of single outcome measures such as waiting times does not accurately reflect the effectiveness of the ENP role.³⁰ If meaningful data about the effectiveness of the ENP role are to be obtained, future research agendas should focus on the use of multiple methods and a range of outcome measures,³⁰ for example, efficiency, effectiveness, safety of ENPC care, patient satisfaction, ED staff satisfaction and clinical decision outcomes.

There were a number of limitations to the present study that should be considered when interpreting the findings. The major limitation of the present study was sampling: the sample size of the ENPC diagnostic subgroups was too small to achieve statistical power and there were between-group differences in the proportions of patients with hand/wrist fractures and removal of POP. These between-group differences may account for some of the variability in treatment times and ED LOS between diagnostic groups. A multisite study using case-control methods with a larger sample size is warranted. A randomized study design would have been ideal; however, this was not possible given that the present study was part of evaluation of the implementation of the ENPC role and there was only one ENPC. Once the ENPC role is well established and there are greater numbers of ENPC, further research using a randomized design would be useful.

Use of times as a primary outcome measure and use of the ED information system may also be limitations.

Questions may be raised to the accuracy of data extracted from the ED information system. However, these are the same data used by organizational and government agencies to evaluate ED performance and it was not possible to control for delays in data entry.

It may be argued that ENPC managed patients were less complicated than patients in the control group; however, study data do not support this proposition. No ENPC patients required handover to medical staff because they were beyond the scope of ENPC care, group equivalence was demonstrated in terms of age and triage category and all patients in the present study were discharged from the ED. Finally, contextual factors related to the recent implementation of the ENPC role may also be a limitation of the present study. During the data collection period, the ENPC had to discuss every case with an emergency physician, obtain counter-signatures for extensions to practice such as medications and verify results of imaging and pathology. The emergency physicians also had to complete peer review ratings for supervision and appropriateness of medications, imaging and pathology for each patient. It is reasonable to assume that these processes, although necessary for safe implementation the ENP role, may result in delays for ENPC patients. Once the ENPC is endorsed by the NBV and able to practice independently as an ENP, these processes will not be required and further improvements in ED treatment times and ED LOS are anticipated.

Conclusion

Patient flow outcomes for ENPC managed patients are comparable with those of patients managed via usual ED processes; however, further research using controlled designs and larger samples is warranted. The ENP model of care is a potentially important strategy in the management of increased service demands in Victorian ED. Rigorous and ongoing evaluation of the ENP role as it evolves in Victorian ED is pivotal to establishing a reliable body of knowledge that can be used to inform the precise role of ENP in emergency care policy and workforce planning.

Acknowledgements

The authors acknowledge the support of the Victorian Department of Human Services (Nurse Policy Branch), the Executive of Northern Health/TNH and Doreen

Power, Operations Director (Emergency, Paediatrics and Obstetrics).

Author contributions

Julie Considine and Roslyn Martin conceived the study and collected the study data. Julie Considine analysed the data and was the principle author of the manuscript. Julie Considine, Roslyn Martin, DeVilliers Smit, Craig Winter and Jane Jenkins contributed to authorship of the manuscript. All authors read and approved the final manuscript.

Competing interests

None declared.

Accepted 10 April 2006

References

1. Byrne G, Richardson D, Brunson J, Patel A. Patient satisfaction with emergency nurse practitioner in A&E. *J. Clin. Nurs.* 2000; **9**: 83–93.
2. Rhee KJ, Dermeyer AL. Patient satisfaction with a nurse practitioner in a University emergency service. *Ann. Emerg. Med.* 1995; **26**: 130–2.
3. Cole FL, Mackey TA, Lindenberg J. Wait time and satisfaction with care and service at a nurse practitioner managed clinic. *J. Am. Acad. Nurse Pract.* 2001; **13**: 467–72.
4. Chang E, Daly J, Hawkins A et al. An evaluation of the nurse practitioner role in a major rural emergency department. *J. Adv. Nurs.* 1999; **30**: 260–8.
5. Gardner A, Gardner G. A trial of nurse practitioner scope of practice. *J. Adv. Nurs.* 2005; **49**: 135–45.
6. Victorian Department of Human Services. *The Victorian Nurse Practitioner Project: Final Report of the Taskforce*. Melbourne: Policy Development and Planning Division. Victorian Government Department of Human Services, 1999.
7. Nurses Board of Victoria. Process for nurse practitioner endorsement, 2003. Available from URL: [http://www.nbv.org.au/nbv/nbvonline1.nsf/attachment/NPPProcessforendorsement/\\$file/NPPProcessforendorsement.pdf](http://www.nbv.org.au/nbv/nbvonline1.nsf/attachment/NPPProcessforendorsement/$file/NPPProcessforendorsement.pdf) [Accessed May 2005]
8. Nurses (Amendment) Act. Act No. 94/2000. Melbourne, Victoria. 2000.
9. Victorian Department of Human Services. Nursing in Victoria: nurse practitioner. Available from URL: <http://www.health.vic.gov.au/nursing/furthering/practitioner.htm>, 2005. [Last accessed February 2006].
10. Byrne G, Richardson M, Brunson J, Patel A. An evaluation of the care of patients with minor injuries in emergency settings. *Accid. Emerg. Nurs.* 2000; **8**: 101–9.
11. Horrocks S, Anderson E, Salisbury C. Review: nurse practitioner primary care improves patient satisfaction and quality of care with no difference in health outcomes. *Evid. Based Nurs.* 2002; **5**: 121.
12. Barr M, Johnston D, McConnell D. Patient satisfaction with a new nurse practitioner service. *Accid. Emerg. Nurs.* 2000; **8**: 144–7.
13. Powers MJ, Jalowiec A, Reichelt PA. Nurse practitioner and physician care compared for nonurgent emergency room patients. *Nurse Pract.* 1984; **9**: 39,42,44–5.
14. Cooper MA, Lindsay GM, Kinn S, Swann I. Evaluating emergency nurse practitioner services: a randomised controlled trial. *J. Adv. Nurs.* 2002; **40**: 721–30.
15. Beales J. Innovation in accident and emergency management: establishing a nurse practitioner-run minor injuries/primary care unit. *Accid. Emerg. Nurs.* 1997; **5**: 71–5.
16. Cooper M, Kinn S, Ibbotson T, Lindsay G, Swann I. Emergency nurse practitioner's documentation: development of an audit tool. *Emerg. Nurse* 2000; **8**: 34–9.
17. Allerston J, Justham D. Nurse practitioners and the Ottawa Ankle Rules: comparisons with medical staff in requesting X-rays for ankle injured patients. *Accid. Emerg. Nurs.* 2000; **8**: 110–15.
18. Mann CJ, Grant I, Guly H, Hughes P. Use of the Ottawa ankle rules by nurse practitioners. *J. Accid. Emerg. Med.* 1998; **15**: 315.
19. Overton-Brown P, Anthony D. Towards a partnership in care: nurses' and doctors' interpretation of extremity trauma radiology. *J. Adv. Nurs.* 1998; **27**: 890–6.
20. Meek S, Kendall J, Porter J, Freij R. Can accident and emergency nurse practitioners interpret radiographs? A multicentre study. *J. Accid. Emerg. Med.* 1998; **15**: 105–7.
21. Sakr M, Angus J, Perrin J, Nixon C, Nicholl J, Wardrope J. Care of minor injuries by emergency nurse practitioners or junior doctors: a randomised controlled trial. *Lancet* 1999; **354**: 1321–6.
22. Australasian College for Emergency Medicine. Policy document: standard terminology, 2001. Available from URL: http://www.acem.org.au/media/policies_and_guidelines/standard_terminology.pdf [Accessed May 2005]
23. Roberts RF, Innes KC, Walker SM. Casemix: moving forward. Introducing ICD-10-AM in Australian hospitals. *Med. J. Aust.* 1998; **169**: S32–S35.
24. Machin D, Campbell M. *Statistical Tables for the Design of Clinical Trials*. Oxford: Blackwell Scientific Publications, 1987.
25. Polit DF, Hungler BP. *Nursing Research: Principles and Methods*, 6th edn. Philadelphia: Lippincott, Williams & Wilkins 1999.
26. Gravetter F, Wallnau L. *Statistics for the Behavioral Sciences*, 5th edn. Stamford: Wadsworth/Thomson Learning, 2000.
27. Brace N, Kemp R, Snelgar R. *SPSS for Psychologists*, 2nd edn. Hampshire: Palgrave MacMillan, 2003.
28. Australasian College for Emergency Medicine. Policy document: the Australasian Triage Scale, 2000. Available from URL: http://www.acem.org.au/media/policies_and_guidelines/P06_Aust_Triage_Scale_-_Nov_2000.pdf [Accessed May 2005]
29. Allerston J, Justham D. A case-control study of the transit times through an accident and emergency department of ankle injured patients assessed using the Ottawa Ankle Rules. *Accid. Emerg. Nurs.* 2000; **8**: 148–54.
30. Tye CC. The emergency nurse practitioner role in major accident and emergency departments: professional issues and the research agenda. *J. Adv. Nurs.* 1997; **26**: 364–70.

Copyright of *Emergency Medicine Australasia* is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.