



PROVIDER TO PATIENT RATIOS FOR NURSE PRACTITIONERS AND PHYSICIAN ASSISTANTS IN CRITICAL CARE UNITS

By Ruth Kleinpell, RN, PhD, Nicholas S. Ward, MD, Lynn A. Kelso, RN, MS, Fred P. Mollenkopf, Jr, PA-C, and Douglas Houghton, MSN, ARNP, CCRN

Background Nurse practitioners and physician assistants are being increasingly integrated into intensive care unit and hospital-based care teams, yet limited information is available on provider to patient ratios.

Objective To determine current provider to patient ratios for nurse practitioners and physician assistants working in intensive and acute care units and to assess factors that affect the ratios.

Methods A descriptive study design was used with a Web-based survey of members of the American Association of Nurse Practitioners, American Academy of Physician Assistants, and the Society of Critical Care Medicine.

Results Responses were received from 222 nurse practitioners and 211 physician assistants from all but 8 of the 50 United States and from Canada. Mean provider to patient ratios in intensive care were 1 to 5 (range, 1 to 3-1 to 8). In pediatric intensive care, the mean ratio of nurse practitioners to patients was 1 to 4 (range, 1 to 3-1 to 8). Factors that affected nurse practitioner and physician assistant provider to patient ratios included patients' severity of illness, number of patients in the unit, number of providers in the unit, patient diagnosis, number of physicians in the unit, time of day, and number of fellows and medical residents on service.

Conclusions Additional information on factors influencing provider to patient ratios and specific components of the roles of nurse practitioners and physician assistants will be important to ensure the best utilization of these providers to enable optimal patient care outcomes. (*American Journal of Critical Care*. 2015;24:e16-e21)

Use of advanced practice providers, including nurse practitioners (NPs) and physician assistants (PAs), is increasingly being adopted as a strategy to augment staffing and promote continuity and quality care in the intensive care unit (ICU). Use of NPs and PAs in multidisciplinary staffing has been identified as a solution for meeting the shortage of physicians caused by implementation of the duty-hour regulations of the Accreditation Council for Graduate Medical Education.¹ A recent University Health System Consortium national survey² of 25 organizations indicated that the regulations were the primary reason for employing NPs and PAs in the hospital setting; other reasons, in order, were improving access to care, patient throughput, physician productivity, and continuity of care.

Currently, more than 205 000 NPs and more than 93 000 PAs are practicing in the United States.^{3,4} Although these numbers are impressive, the number of advanced practice providers educated and trained to work in the ICU is much less, with more than 10 000 NPs certified as acute care NPs and approximately 4000 working in acute and intensive care units.^{4,5}

NPs and PAs are collectively termed advanced practice providers and are practitioners with advanced training at the master's or doctoral level in the management of patients with acute and critical illness. In intensive and acute care units, general roles and responsibilities of NPs and PAs include assessing patients, obtaining patients' history and doing physical examinations, making rounds with the multidisciplinary team, and, for NPs and PAs who have credentials and privileges, performing invasive procedures (eg, suturing, placing central and arterial catheters), and assisting in surgery under the supervision of a physician.^{4,6,7} Other roles include serving

as first responders for institutional rapid response teams and cardiac arrest teams, doing evaluation and triage for patients outside the ICU, acting as a preceptor for medical and nursing students, providing support and education to the clinical nursing staff, and communicating with patients and patients' families.^{8,9} Although the roles and practice of NPs and PAs in the ICU and other hospital-based practices have been studied,¹⁰⁻¹⁴ aside from several investigations^{8,15,16} done in single institutions, published information on provider to patient ratios for NPs and PAs is limited. Information on these ratios is needed to plan for appropriate staffing coverage to enhance strategic planning for patient care in intensive and acute care units. Therefore, the purpose of this study was to determine current provider to patient ratios for NPs and PAs working in ICUs and acute care units and to assess factors that affect these ratios.

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About the Authors

Ruth Kleinpell is director, Center for Clinical Research and Scholarship, Rush University Medical Center; professor, Rush University College of Nursing; and acute care nurse practitioner, Rush Lincoln Park, Chicago, Illinois. **Nicholas S. Ward** is an intensivist at Rhode Island Hospital and an associate professor of medicine at Warren Alpert Medical School, Brown University, Providence, Rhode Island. **Lynn A. Kelso** is an assistant professor, University of Kentucky College of Nursing, and an acute care nurse practitioner, Department of Pulmonary, Critical Care, and Sleep Medicine, University of Kentucky, Lexington, Kentucky. **Fred P. Mollenkopf, Jr** is a physician assistant, Thoracic and Cardiovascular Institute, Lansing, Michigan. **Douglas Houghton** is an acute care nurse practitioner in the trauma intensive care unit, Jackson Health System, Miami Florida.

Corresponding author: Ruth Kleinpell, RN, PhD, FCCM, Rush University Medical Center, 600 S Paulina Ave, 1062B AAC, Chicago, IL 60657 (e-mail: ruth_m_kleinpell@rush.edu).

Methods

A descriptive study design was used with a Web-based survey adapted from a previous national survey¹⁷ of intensivists on provider to patient ratios in ICUs. The Society of Critical Care Medicine Taskforce on ICU Staffing was charged with providing recommendations for intensivists and hospitals on maximum patient workloads. As part of the task force's work, a national survey of pulmonary critical care program directors and intensivists was conducted to assess information on provider to patient ratios for intensivists in medical ICUs.¹⁷ That survey, developed on the basis of a review of the literature and expert opinion, was adapted for the current study because a secondary focus of the task force's work

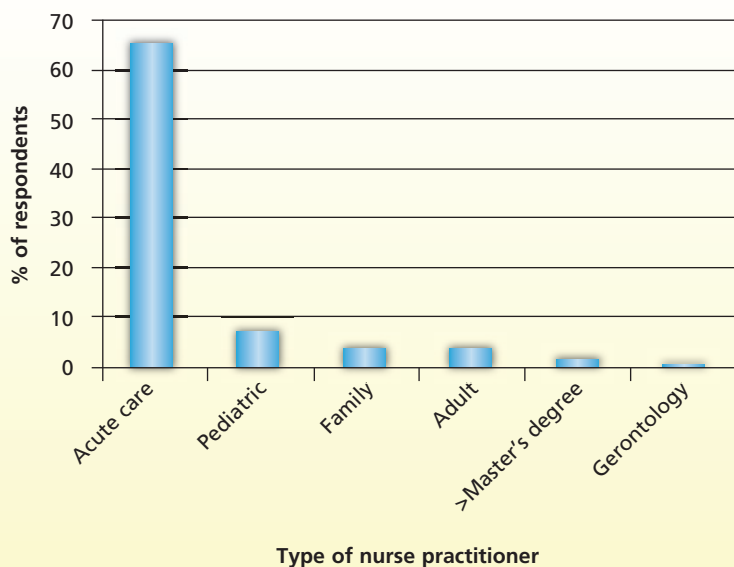


Figure 1 Nurse practitioner certifications of 222 respondents.

was to assess provider to patient ratios for NPs and PAs in the ICU. The adapted survey was pilot tested for clarity and comprehension with 5 NP and PA clinicians to ensure clarity and comprehension and to evaluate content validity. The Web-based survey was then sent via e-mail to NPs and PAs working in ICU and acute care hospital units who were part of the membership of the 3 US organizations with the largest numbers of NPs and PAs: Society of Critical Care Medicine, American Association of Nurse Practitioners, and American Academy of Physician Assistants. In attempts to reach NPs and PAs who worked in ICUs and acute care units, the invitations to participate in the study indicated that the inclusion criterion for participating in the survey was a current NP or PA position in an ICU or acute care unit or a service-based specialty role directly managing acute and critically ill patients.

Results

A total of 222 NPs and 211 PAs responded to the survey. The respondents represented all but 8 of the 50 United States and included NPs and PAs from Canada. The majority of NP respondents (68.3%) reported that they had certification as an acute care nurse practitioner (Figure 1), and a majority of PA respondents (58%) reported that they had a master's degree (Figure 2).

NPs reported working in a variety of settings, including medical-surgical ICUs (35%), surgical ICUs (18%), cardiothoracic ICUs (16%), neurosurgical ICUs (10%), coronary care units (3%), telemetry/step-down units (4%), and trauma and burn ICUs (3%). NPs also reported employment in other areas of care, including subacute care and specialty-based practices, such as cardiology, neurology, orthopedics, and pain services. PAs reported working predominantly in cardiothoracic ICUs (60%) and other ICU settings (15%). PAs also were employed in other areas, including emergency departments, operating rooms, and general inpatient units. A total of 25 NP respondents worked in pediatric ICUs.

The number of NPs employed by individual hospitals ranged from 1 to 200; most hospitals employed 1 to 100 NPs. The number of PAs employed by hospitals ranged from a low of 1 to 25 to a high of more than 200 at a single hospital. The majority of hospitals employed 1 to 50 PAs. The number of NPs employed per ICU was from 1 to 5 up to 25; the number of PAs employed per ICU was from 1 to 5.

Mean provider to patient ratios in the ICU were 1 to 5 (range, 1 to 3-1 to 8) for both NPs and PAs (see Table). In pediatric ICUs, the mean provider to patient ratio was 1 to 4 (range, 1 to 3-1 to 8).

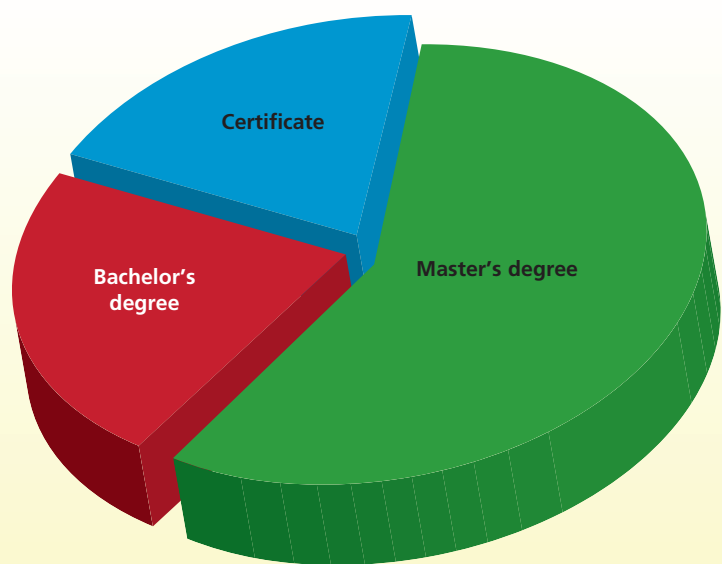


Figure 2 Education of 211 physician assistant respondents.

Table
Nurse practitioner and physician assistant provider to patient ratios

Ratio	Unit		
	Adult intensive care	Pediatric intensive care	Telemetry/step-down
Mean	1 to 5	1 to 4	1 to 10
Range	1 to 3-1 to 8	1 to 3-1 to 8	1 to 8-1 to 20

In 121 units that integrated fellows and medical residents, the mean NP or PA provider to patient ratio was 1 to 4 (range, 1 to 3 - 1 to 8). The number of NPs and PAs who were service based and provided care for patients on other hospital units, such as subacute care, telemetry, and acute care inpatient medical or surgical units, was small (16 NPs and 12 PAs), and the provider to patient ratio was from 1 to 10 up to 1 to 15 or more, depending on the clinical setting. Several respondents indicated that the provider to patient ratio increased on the off shifts, with ratios increasing to 1 to 9 on the night shift in the ICU and up to 1 to 15 or more on telemetry, subacute, and other acute care hospital units. However, several respondents commented that ratios of 1 to 15 or more on these units posed workload concerns, especially with changing acuity levels of hospitalized patients and admission and discharge of patients.

As shown in Figure 3, participants identified several factors that affected provider to patient ratios for NPs and PAs, including patient's severity of illness; number of patients in the unit; number of providers in the unit; and other factors, such as patient's diagnosis, the number of physicians in the unit, the time of day, and the number of medical or surgical residents on service. Additional considerations that influenced provider to patient ratios for service-based NPs (n=16) and PAs (n=12) included the number of patients outside the ICU needing to be seen by the provider, number of transfers and admissions, and continuity of care considerations.

Discussion

The importance of matching staffing models in the ICU to ensure patient safety for acute and critically ill patients is well recognized, as the number of ICU beds has continued to increase.¹⁸ Although the ICU intensivist physician staffing model is advocated for best patient care, the continued shortage of intensivists necessitates consideration of alternative staffing models. We found that hospitals and ICUs are using NPs and PAs in increasing numbers, with some ICUs reporting use of up to 20 or more and hospitals with up to 400 or more advanced practice providers. Similarly, in a study of 25 hospitals that used NPs and PAs, Moote et al² found that some hospitals employed up to 350 or more of these practitioners. NPs and PAs have become essential members of the ICU team who can assist in patient care management as well as promote implementation of evidence-based practice and continuity of care. Therefore, information on current practices related to provider to patient ratios for

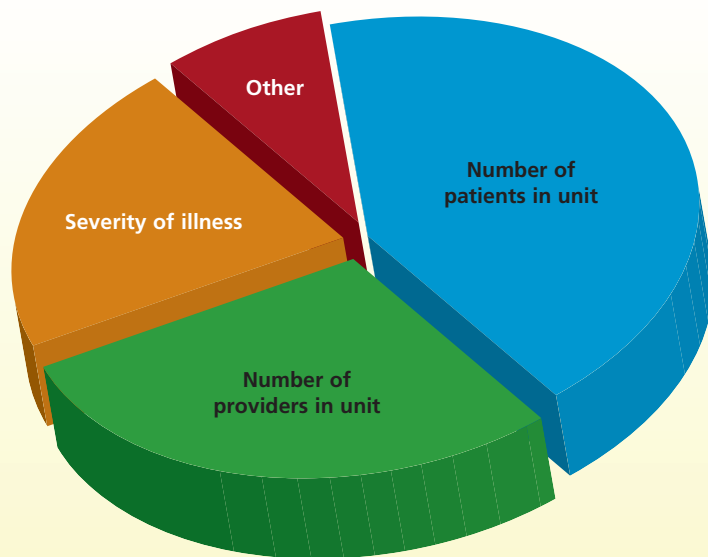


Figure 3 Factors affecting nurse practitioner or physician assistant provider to patient ratios. Other: patient's diagnosis, number of physicians, time of day, residents' schedule, number of admissions and transfers.

NPs and PAs is important for strategic planning for staffing models of care.

In our study, the majority of NP respondents reported receiving certification as acute care nurse practitioners. Although NPs with other educational preparation such as specialized training in family, adult, or gerontology care also practice in hospital settings, only acute care nurse practitioners have been educated and trained and have a scope of practice to manage critically ill patients in ICUs.^{19,20} Ensuring appropriate scope of practice is an essential aspect of utilizing NPs and PAs in the ICU.

Similarly for PAs, critical care training or fellowships in critical care can help ensure that essential skills for managing acute and critically ill patients are mastered beyond the primary care-focused training of the majority of PA programs. However, unlike NPs, PAs do not have a designated scope of practice based on education, national certification, or state board regulations.

Ensuring appropriate staffing in the ICU is an established area of focus for optimizing ICU care. Several factors influence NP and PA provider to patient ratios, including the number of ICU beds, number of shifts per day, desired ICU occupancy rate, number of days each professional is working per

Intensive care units are using more and more nurse practitioners and physician assistants, sometimes more than 20 in a unit.

week, patient's severity of illness, the level of care, and the clinical, research, and teaching workload.²¹

A survey¹⁷ of intensivists on patient to intensivist ratios indicated that the mean ratio of patient to attending physician was 13 to 1, with an upper limit of 24 to 1 at night. In that study,¹⁷ factors that affected physician to patient ratios included number of ICU beds, mean daily census, and maximum service size (number of physicians). Among the respondents, 22% indicated that NPs or PAs were used in the ICU; however, no information was provided on the patient to NP or PA provider ratios.

Only acute care nurse practitioners have a scope of practice to manage critically ill patients.

In our survey, NPs and PAs reported mean provider to patient ratios of 1 to 5 in the ICU, with a range of 1 to 3 up to 1 to 8. This finding is consistent with a recent report²² of one institution's experience in implementing use of NPs in the ICU. In pediatric ICUs, the mean

NP or PA provider to patient ratios was 1 to 4 (range, 1 to 3-1 to 8). However, the small number of respondents (n = 25) in our study who had certification as advanced practitioners in pediatrics necessitates further exploration of pediatric patient to provider ratios. In settings (n = 111) with fellows and medical residents on staff, the mean NP or PA provider to patient ratio was 1 to 4 (range, 1 to 3-1 to 8), suggesting that in ICUs in which residents and fellows provided care, NP and PA provider to patient ratios were lower than in units without resident and fellows as care providers. For the small number of service-based NPs (n = 16) and PAs (n = 12) who provided care to patients in other hospital units, such as subacute care, telemetry, and acute care inpatient medical or surgical units, the provider to patient ratios were 1 to 10 up to 1 to 15 or more, depending on the unit.

Similar to the findings of Moote et al,² our results indicated that several factors influence NP or PA provider to patient ratios, including number of beds, number of clinicians working, and time of day. In our study, other factors that influenced provider to patient ratios for NPs and PAs included the number of patients outside the ICU who needed to be seen by the provider, number of transfers and admissions, and continuity of care. Our respondents reported that these factors were considered by lead NPs, PAs, or intensivist unit directors in charge of scheduling patient care assignments for NPs and PAs.

Additional data are needed on how variations in practice patterns, staffing patterns, type of ICU unit, type of multidisciplinary model of care, specific patient acuity levels, and specific components of the roles of NPs and PAs affect NP or PA provider to patient ratios in both adult and pediatric units. Many institutions are implementing alternative staffing models that include use of NPs and PAs to meet the needs of acute and critically ill patients, and recent reports highlight the benefit to providing quality of care in the ICU.²³⁻²⁹ Additional research is needed to determine optimal NP or PA provider to patient ratios based on factors such as changes in patient acuity levels, need for invasive and therapeutic procedures, daily admission and discharge numbers, educational needs of patients and patients' families, and time spent by advanced practice providers in nonclinical duties. This research is especially important, because the roles of NPs and PAs are extending beyond general patient care management to include oversight of evidence-based practice initiatives and clinical staff education.⁶ Ultimately, the optimal NP or PA to patient ratio is one that best affects patient care outcomes—and research is needed to further elucidate this ratio.

Our study has several limitations, including the use of a descriptive study design, the use of survey methods to assess perceptions rather than objective data from respondents, and self-reported data, which may not be accurate. Participants in the study were recruited from the largest US organizations of NP and PA practitioners to provide a diverse representation of practitioners; however the sample size is not representative of all NPs and PAs working in intensive and acute care units. Response rates could not be calculated because surveys were sent via e-mail with inclusion criteria defined, information that was not identifiable in the organizational databases. Additionally, survey responses, such as factors that affect NP or PA provider to patient ratios, do not include all possible factors. The focus of the survey was on NPs and PAs working in acute and critical care settings, not just ICU-based settings, because the practice of NPs and PAs is not setting specific but rather is based on patient care needs. Specialty-based roles of NPs and PAs are well recognized; for example, NPs and PAs may work with a cardiology physicians practice group and may provide care for patients from hospitalization through clinical follow-up after discharge. In our survey, the responses of NPs and PAs who were unit based did not differ from the responses of NPs and PAs who were specialty based. However additional study on specialty- and unit-based practice roles is warranted.

Conclusion

This national survey is the first on provider to patient ratios for NPs and PAs working in ICUs and acute care units. The results indicate that several factors need to be considered when determining the optimal provider to patient ratio for NPs or PAs in the ICU, including patient's severity of illness, number of patients in the unit, and total number of providers in the unit. Other factors include patient diagnosis, number of physicians in the unit, time of day, and number of fellows and medical residents available. Mean provider to patient ratio in the ICU was 1 to 5 (range, 1 to 3-1 to 8) for both NPs and PAs. In pediatric ICUs, the mean NP and PA to patient ratio was 1 to 4. In those ICU settings with care also provided by fellows and medical residents, the mean NP and PA provider to patient ratio was 1 to 4. Our results have implications for medical and nursing directors, intensivist and hospitalist teams, and practice administrators because several factors should be considered when determining appropriate staffing ratios for NPs and PAs, including patient acuity, diagnosis and care needs, admission and transfer rates, and other factors that could potentially affect continuity of care. As the use of NPs and PAs continues to increase to meet the demands of patient care in ICUs and hospital-based units, additional information on factors including patient ratios and the role of NPs and PAs will be important to ensure the best utilization of advanced practice providers for optimal patient care outcomes.

FINANCIAL DISCLOSURES

None reported.

eLetters

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