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Impact of advanced practice providers (nurse practitioners and physician assistants) on surgical residents' critical care experience

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ABSTRACT

Background: Teaching hospitals often employ advanced practice providers (nurse practitioners and physician assistants or APPs) to counteract residents' work-hour restrictions. With increased utilization of APPs in labor-intense areas, such as intensive care units (ICUs), APPs may have an impact on resident education and experience. No studies have investigated the direct role an APP plays on the training experience of a surgical resident in the ICU.

Materials and methods: An institutional review board-approved survey was emailed to residents in Accreditation Council for Graduate Medical Education-accredited general surgery programs. Surveys asked about demographics, residency and/or ICU characteristics, and the effects of APPs on patient care, workflow, and educational experience. Regression analysis determined predictors of resident perception.

Results: A total of 354 of 1178 residents responded to the survey (30%). Some residents felt that nurses calling APPs preferentially for patient-care issues interfered with education (17%) and residents' ability to follow patients (12%) and was associated with overall detrimental effects to ICU experience on regression (odds ratio, 3.7; confidence interval, 1.5–9.1). Most residents reported positive effects of APPs, such as reduced resident workload (79.8%), teaching protocols and/or guidelines (60.3%), enhanced patient care (60.3%), and enhanced communication (50.5%). When asked how APPs affected their overall ICU experience, 48.4% reported positive effects, 20.6% reported "no effect," and 31% reported detrimental effects.

Conclusions: Only a minority of residents perceived that APPs detract from training, particularly those who felt excluded when nurses preferentially contact APPs with patient-care issues. APPs have the potential to enhance training and ICU experience, as reflected in many of the responses. Strategies to maintain direct nurse and resident communication might preserve residents' perception of the educational value of APPs.

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1. Background

Beginning in 2003, the Accreditation Council for Graduate Medical Education (ACGME) mandated a significant reduction in resident work hours. The ACGME work-hour restrictions have greatly affected many academic medical centers and hospital services that rely on the physician trainees as a significant part of the workforce. These effects influence the workflow systems and physician manpower in more labor-intense units such as intensive care units (ICUs) [1]. In response to the new resident work-hour restrictions, many medical centers have employed advanced practice providers (APPs), such as nurse practitioners (NPs) and physician assistants (PAs), to compensate for gaps in provider coverage and patient care [2]. A survey of academic medical centers demonstrated that 81% ($n = 21$) used APPs as resident substitutes and respondents ranked ACGME work-hour restriction and decreased labor force as a primary reason for employing APPs [3].

With the ever-growing utilization of APPs in the ICUs, APPs are likely to play a significant role in resident education and ICU experience. No studies have been conducted to investigate the direct role an APP plays on the work and training experience of a resident in the ICU. The purpose of this study was to determine residents' perceptions of the effect that APPs have on the resident's training experience in the ICU setting, with a hypothesis that residents will have an overall positive perception. In addition, this study will analyze responses for predictors of a negative perception, with the goal of ultimately creating strategies to foster a positive relationship between the two groups of health care providers.

2. Materials and methods

A 17-question survey was designed to assess surgical resident's perceptions of the impact of APPs on residents' training experience in the ICUs. Year in training, gender, training program characteristics, ICU characteristics, perception of APPs providing patient care, and resident experience were assessed. Questions about ICU characteristics specifically addressed open *versus* closed status, how long APPs had been integrated, inhouse coverage models, and which (if any) procedures APPs performed. Residents were asked to quantify the effect of APPs performing procedures on their training on a scale of 0–100 (0 = significantly detracts, 50 = no effect, and 100 = significantly enhances). In addition, questions were asked regarding line and/or paths of communication between nurses and providers to determine who the nurses primarily call for patient-care issues. Residents were asked how calls preferentially going to APPs affected their training experience. On a 0–100 scale as described previously, residents were asked about how APPs affected their education and their relationship with the ICU attending. The survey also asked if APPs ever serve as supervisors for residents (answers on a 0–100 scale: 0 = never, 50 = sometimes, and 100 = always). Finally, they were asked about the overall effect of APPs on a 5-point Likert scale. Before distribution, surveys were reviewed by a statistician and pilot-tested with cognitive interviewing on recent surgical trainee graduates. Study approval was granted by the Vanderbilt University Institutional Review Board (IRB#140245).

An introductory letter with the survey link was sent to general surgery residency program coordinators in the United States ($n = 250$) via a list serve of trainee programs. Confirmation that the survey link was distributed to the surgical trainees was requested and a follow-up reminder email was sent to all the program coordinators. Total sample size for the purposes of response was based on confirmation of distribution by the program coordinator. The survey was open for 90 d. The survey engine was designed so that responses were anonymous. Responses were quantitatively analyzed. Regression analysis was used to determine which factors and characteristics correlated with positive and negative perceptions. Standard univariate analysis determined differences in categorical variables. Ordinal logistic regression was used to determine independent association with intended outcome.

3. Results

3.1. *Demographics and ICU characteristics*

Of the 1178 residents surveyed, 354 responded (30%). Full demographics are reported in the Table. Figure 1 demonstrates that most ICUs have had five or more years of ICU presence. In addition, 73.6% of respondents reported that APPs performed procedures in their ICUs. Figure 2 shows the percentage of distinct procedures performed, reported by procedure type.

3.2. *Resident and APP interactions*

3.2.1. *Procedures*

In ICUs where APPs perform procedures, residents reported a median score of 40 (interquartile range [IQR], 25.5–55.5) in how it affects their training and/or education (scale: 0-significantly detract from training, 50-no effect, and 100-significantly enhance training).

3.2.2. *Positive characteristics of APPs*

When asked about positive characteristics of APPs, most residents reported positive attributes to APP presence (Fig. 3). The most popular answer selected was "reduce resident workload," chosen by 79.8% of the respondents. Approximately 5% of residents reported that there were no positive benefits to working with APPs.

3.2.3. *Who do they contact for orders and how does it affect resident experience?*

When asked who their ICU nurses called first with patient-care issues, respondents reported APPs (14.6%), residents (23.3%), both equally (39.0%), APPs for smaller issues and the residents for important issues (13.9%), residents for smaller issues and APPs for important issues (4.5%), and none of the above (4.5%).

Those who reported that nurses were preferentially contacted reported that it detracts from training and/or learning

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