

Preserving the Educational Value of Call in a Diagnostic Radiology Residency Program

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Purpose: Our study was designed to determine residents' opinions of the advantages, disadvantages and educational value of a traditional "Tandem Call" (TC) model as compared to night float (NF). Because TC is more representative of adult learning principles and constructivist theory, we hypothesized that resident satisfaction and educational outcomes would demonstrate a preference for, and the educational efficacy of, the TC model.

Methods: We surveyed all residents in a university-based radiology residency on their opinions of TC and its educational value. Aggregate data from annual Graduate Medical Education Committee institutional surveys (2008-2012) and annual radiology alumni surveys (2009-2012) were reviewed as measures of satisfaction with TC. Performance on the ABR oral exam was a proxy for educational outcome. Quality data for the year of study and prior years in which TC was in effect were reviewed as a measure of patient safety.

Results: The great majority of respondents attributed confidence/competence on call and added value to their education directly to TC. A majority believed that teamwork required for TC facilitated more positive relationships among residents and more peer teaching. Most said that they would not prefer NF. Almost all believed indirect supervision with attending backup aided in developing confidence in performance. Quality data confirmed a low number of discrepancies between preliminary resident and final attending reads.

Conclusions: TC provides a more consistent call experience throughout residency than NF. TC is valued by residents, facilitates retrieval-based learning and development of independence and efficiency, and parallels essential elements of team-based learning. Quality data suggests that lack of 24-hour attending supervision is not detrimental to patient safety.

Key Words: Resident education, radiology, call

J Am Coll Radiol 2014;11:68-73. © 2014 Published by Elsevier on behalf of American College of Radiology

INTRODUCTION

Call, one of medical training's most stressful "rites of passage," is a critical component of residency. During call, a resident uses knowledge gained through clinical rotations and outside study to make safe, independent decisions without immediate review by an attending. Call fosters confidence and accuracy that will later be essential in a busy private or academic practice. Most residents remember their call experience as stressful, highly motivating, and always educational [1].

Many residency programs have adopted night float (NF) rotations in response to ACGME duty hours mandates, although the impact on resident education is

unclear. ACGME defines *night float* as a rotation with an educational focus, designed to eliminate in-house call or assist other residents during the night [2]. Residents on NF work evening/night shifts and do not have day assignments. Generally NF rotations occur in blocks of 2 or 4 weeks, with no more than 6 consecutive nights of call. NF rotations vary with each residency program, but may occur as few as 4 to 6 times throughout residency, in contrast to traditional rotational call, which occurs several times every month. Reported advantages of NF are less resident stress and fatigue, enhanced alertness, and perceptions of improved patient care with fewer errors [3]. Potential disadvantages include disrupting the service-education balance and a more passive education milieu, viewing residents as students rather than apprentices responsible for direct patient care. Secondary disadvantages include exposure to fewer cases, less opportunity for teaching and learning, less attending MD contact, and fewer conferences attended [4-7].

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Respondents to the annual 2012 ACR Annual Chief Resident Survey (259 chief residents from 148 institutions) reported 77% of radiology programs now use a form of NF or hybrid call. Approximately 50% of programs have extended-hour shifts ending between 10 PM and midnight. Most (57%) chiefs believe 24/7 in-house attending coverage has a negative impact on education; only 16% reported 24/7 coverage [8].

Service-education balance has been discussed widely in the medical and surgical literature, but is less studied in radiology. For radiology residents, service activities include contrast injections, triage, protocols, informed consent, reading studies, telephoning results, and correlating patient data. Educational activities include case review with radiologists, case conferences and presentations, independent reading, didactic lectures, and scholarly activity [9]. In contrast to medical and surgical specialties, on which maximum limits for service activities are imposed, radiology's Residency Review Committee mandates a minimum program volume of $\geq 7,000$ radiologic examinations per year per resident, acknowledging the correlation between case experience and diagnostic competence [10]. Call schedule optimization is one strategy to maintain education and service balance. Due in part to TC, our residents interpret well over 10,000 cases per year.

TANDEM CALL

In 2003, we challenged our residents to restructure call to comply with new ACGME duty hours requirements. We aimed to preserve the educational value of traditional call and include first-year residents to prepare them for independent call. "Tandem Call" (TC) was created and was modified as ACGME duty hours standards changed.

Our TC team covers 4 hospitals from 1 reading room, using PACS and teleradiology. One attending supervises the team and finalizes reads from 5 PM until 9 PM on weekdays, and from 8 AM until 8 PM on weekends. After the attending leaves, all reports are posted as preliminary reads to be reviewed and finalized the next day.

TC is a variation of the "buddy" system, pairing an upper level resident with a novice resident. First-year radiology residents (R1) begin call under supervision of senior residents in August. Their call is a 24-hour shift every sixth to eighth night. Duties are service oriented—phone and pagers, triage, protocols, preliminary arrangements for emergency interventional procedures, teaching the resident to function as a consultant by observation, and, when the attending is present, dictating reports of digital radiographs. Relieved of service responsibilities, the upper level can focus on interpretation of cases and peer teaching.

Independent call begins after satisfactory completion of required educational modules and readiness tests. The upper level (UL) (R2-R4) is team leader, role model, and

teacher to the R1. A "short call" UL resident stays in house to provide coverage from 5 PM until the day's work is caught up, and then provides back up call from home. A "long call" UL covers call from 10 PM until 8 AM the next morning, working in tandem with the R1. All call team residents have the day off post call.

A fourth "day float" UL (R2, R3, R4) provides extra assistance from 2 PM until 10 PM. This resident is not considered part of the call team and does not receive the next day off. Rather, this resident covers the call team on their post call days, minimizing schedule disruptions on various services.

Frequency of call for ULs averages 4 nights per month during R2 and R3 years and the first 6 months of the R4 year. Residents taking the ABR oral exam completed all call requirements before January of the R4 year and did not have call responsibilities during the 6 months before their exam. Comparable relief from call will be provided for residents preparing for the new Core exam.

TC is designed for a medium to large program with ≥ 6 residents per year, given the requirements for team numbers and frequency of call. Resources required for TC are PACS viewing stations, teleradiology between hospitals, chief resident administrative time for scheduling, adequate program size, quality measures for monitoring discrepancies between preliminary and final reports, and attending physician supervision at the appropriate levels.

METHODS

We designed a study to assess the educational value of TC using survey and existing data. The study was approved by the institutional review board of the University of Arkansas for Medical Sciences (UAMS) and deemed Health Insurance Portability and Accountability Act compliant. The study population included all residents in the UAMS diagnostic radiology residency program during the 2011-2012 academic year ($N = 33$).

A satisfaction survey was written by the program director and chief resident after reviewing the literature (survey available online as [supplementary data](#)). Residents were surveyed regarding their opinions on the effects of TC on preparation for and appropriateness of R1 call, confidence and perceived competence on call, relationships between residents, quality of education, and preference for TC versus NF. Gender and education levels were recorded to allow group comparisons.

The survey was administered electronically through an independent internet-based survey site (<http://www.surveymonkey.com>, Palo Alto, CA). An e-mail from the chief resident, with the survey link embedded, explained survey goals and assured anonymity. Participation was voluntary, and completion of the survey constituted consent. Responses were captured electronically without personal identifiable data. Subjects who

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