

# Reliability of Verbal Handoff Assessment and Handoff Quality Before and After Implementation of a Resident Handoff Bundle

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## ABSTRACT

**OBJECTIVE:** 1) To develop validity evidence for the use of the Verbal Handoff Assessment Tool (VHAT) and examine the reliability of VHAT scores, and 2) to determine whether implementation of a resident handoff bundle (RHB) was associated with improved verbal patient handoffs among pediatric resident physicians.

**METHODS:** In a pre–post design, prospectively audio recorded verbal patient handoffs conducted at Boston Children's Hospital before and after implementation of the RHB were rated using the VHAT, which was developed for this study (primary outcome). Using generalizability theory, we evaluated the reliability of VHAT scores.

**RESULTS:** Overall, VHAT scores increased after RHB implementation (mean 142 vs 191, possible score 0–500;  $P < .0001$ ). When accounting for clustering according to resident physician, hospital unit, unit census, and patient complexity, implementation of the RHB was associated with a 63-point increase in VHAT score. Using generalizability the-

ory, we determined that a resident's mean VHAT score on the basis of a handoff of 15 patients assessed by a single observer was sufficiently reliable for relative ranking decisions (ie, norm-based; generalizability coefficient, 0.81), whereas a VHAT score on the basis of a handoff of 21 patients would be sufficiently reliable for high-stakes, standard-based decisions (Phi, 0.80).

**CONCLUSIONS:** Verbal handoffs improved after implementation of a RHB, although gains were variable across the 2 clinical units. The VHAT shows promise as an assessment tool for resident handoff skills. If used for competency or entrustment decisions, a resident's mean VHAT score should be on the basis of observation of verbal handoff of  $\geq 21$  patients.

**KEYWORDS:** graduate medical education; handoff communication; patient handoffs; pediatric residents; workplace-based assessment

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## WHAT'S NEW

This study presents evidence of improved verbal handoff quality following implementation of a handoff training program and provides important validity evidence to support using scores from the Verbal Handoff Assessment Tool to make competency and entrustment decisions.

IN THE WAKE of the 2011 Accreditation Council for Graduate Medical Education duty hour standards, patient handoffs are frequent,<sup>1</sup> yet handoff skills have not been routinely taught.<sup>2</sup> The need for safer patient handoffs has

been well established.<sup>3–6</sup> From 2004 onward, the Joint Commission identified communication failures as root causes of 59% to 82% of “sentinel events”—serious preventable adverse events.<sup>7</sup> These findings prompted the Agency for Healthcare Research and Quality<sup>8,9</sup> and the Joint Commission<sup>3</sup> to designate the patient handoff as a priority target in nationwide efforts to improve patient safety. Despite national emphasis on handoffs, one study of internal medicine trainees revealed that only a quarter of verbal patient handoffs included key handoff elements: the patient's clinical condition, hospital course, and tasks to complete.<sup>10</sup> Limited familiarity with patients might increase the risk that residents omit or inaccurately convey

important handoff data, circumstances that might be exacerbated by duty hour changes.<sup>10–12</sup> Perhaps in recognition of current underperformance, patient handoffs were recently included in the Association of American Medical Colleges' recommendations for entrustable professional activities for entering residency.<sup>13</sup>

Best practices for handoffs have been established, on the basis of demonstrated reductions in medical errors after implementation of a handoff program.<sup>14</sup> Previous studies have reported that team training reduces medical errors<sup>15–17</sup> and that structured communication between clinicians<sup>18,19</sup> and computerized handoff tools<sup>20–22</sup> show promise in improving handoffs. Previously, implementation of a resident handoff bundle (RHB) was associated with reductions in medical errors,<sup>23</sup> improvements in the verbal (oral) handoff environment (eg, handoffs more often occurred in a quiet, private location),<sup>23</sup> and improvements in the completeness of written handoffs.<sup>23</sup> This single-institution study informed the development of the subsequent multicenter I-PASS (Initiative for Innovation in Pediatric Education-Pediatric Research in Inpatient Settings Accelerating Safer Signouts) study, which also reported that implementation of a structured handoff program was associated with reduced medical errors.<sup>14</sup> However, the effect of the RHB on the content and process of verbal handoffs was not formally evaluated. We hypothesized that RHB implementation would be associated with higher-quality verbal patient handoffs among resident physicians. Such an association would provide evidence for a causal relationship between RHB implementation and the observed reduction of medical errors by providing a mechanistic explanation.

To determine whether RHB implementation was associated with improved verbal communication during patient handoffs, we set out to: 1) develop a Verbal Handoff Assessment Tool (VHAT) to measure the quality of verbal handoffs; 2) develop evidence that would support the validity of using scores generated from the VHAT to draw conclusions about resident handoff skills, and 3) compare the quality of verbal handoffs performed before and after implementation of the RHB.

## METHODS

After approval by the Boston Children's Hospital institutional review board, we conducted a prospective pre–post study of verbal patient handoffs on 2 general pediatric units, embedded within a study designed to evaluate the association between the RHB and medical errors.<sup>23</sup> All resident physicians in the Boston Combined Residency Program received training in patient handoffs and were asked to follow new verbal and written handoff processes.

### PARTICIPANTS

Pediatric residents rotating on the 2 study units who provided voluntary written informed consent were eligible to participate. Postgraduate year (PGY)-1 physicians provided direct patient care and were supervised by PGY-3

physicians. We provided small incentives to participating residents (eg, cookies and gift cards).<sup>23</sup>

### INTERVENTION AND SETTING

Details of RHB development and of the 2 study units have been published previously.<sup>23</sup> The 2 study units, referred to as “unit 1” and “unit 2,” were geographically distinct inpatient pediatric hospital wards that admitted general pediatric and specialty pediatric patients. Briefly, the RHB intervention consisted of: 1) team training, in part on the basis of the TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety) method<sup>8</sup>; 2) implementation of verbal handoff process changes; 3) training in best practices for verbal and written handoffs, including use of a standardized mnemonic, “SIGNOUT?” (“Sick or DNR?, Identifying data, General hospital course, New events of day, Overall health status, Upcoming possibilities, Tasks to complete, Any questions?”) for verbal handoffs<sup>18</sup>; and 4) introduction of a computerized handoff tool integrated into the electronic medical record (Cerner PowerChart, Cerner, London, United Kingdom) on unit 1. Unit 2 continued to use a free-text printed handoff document throughout the study period.

The RHB was introduced at a Boston Combined Residency Program retreat on October 1, 2009. Major verbal handoff process changes implemented were: 1) team handoffs, 2) use of a private location, and 3) use of a quiet location. In a team handoff, the departing senior resident conducts the verbal handoff in the presence of the departing intern and the receiving intern and senior. This replaced the previous practice of separate intern and senior resident handoffs.

### AUDIO RECORDINGS

To capture verbal handoff content and process, trained research assistants audio-recorded a convenience sample of handoff sessions conducted before and after RHB implementation. Each audio recording captured 1 “handoff session,” in which 1 resident was the primary speaker, or “giver.” Preintervention sessions were recorded July through September 2009. RHB implementation on October 1, 2009 was followed by a 4-week “wash in” period, during which no sessions were recorded. Postintervention handoff sessions were recorded October 28, 2009 to January 2010. Ten patient handoffs given by a single resident were scored for each handoff session (see decision study results). Raters assigned scores by listening to audio recordings of handoffs, rather than observing live handoff sessions. In the post-intervention period, speakers were PGY-3 trainees for all team handoffs, as specified by the RHB.<sup>23</sup> Because we hypothesized that PGY-3 trainees might have superior handoff skills because of greater experience, the change to a team handoff system could result in better handoff scores in the postintervention period merely because of the elimination of PGY-1 givers. As such, for this analysis, audio-recorded handoffs given by PGY-1 trainees in the preintervention period were purposely undersampled to reduce possible confounding by training year and to improve

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