

Feedback and Assessment Tools for Handoffs: A Systematic Review

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ABSTRACT

Background Resident handoff communication skills are essential components of medical education training. There are no previous systematic reviews of feedback and evaluation tools for physician handoffs.

Objective We performed a systematic review of articles focused on inpatient handoff feedback or assessment tools.

Methods The authors conducted a systematic review of English-language literature published from January 1, 2008, to May 13, 2015 on handoff feedback or assessment tools used in undergraduate or graduate medical education. All articles were reviewed by 2 independent abstractors. Included articles were assessed using a quality scoring system.

Results A total of 26 articles with 32 tools met inclusion criteria, including 3 focused on feedback, 8 on assessment, and 15 on both feedback and assessment. All tools were used in an inpatient setting. Feedback and/or assessment improved the content or organization measures of handoff, while process and professionalism measures were less reliably improved. The Handoff Clinical Evaluation Exercise or a similar tool was used most frequently. Of included studies, 23% (6 of 26) were validity evidence studies, and 31% (8 of 26) of articles included a tool with behavioral anchors. A total of 35% (9 of 26) of studies used simulation or standardized patient encounters.

Conclusions A number of feedback and assessment tools for physician handoffs in several specialties have been studied. Limited research has been done on the studied tools. These tools may assist medical educators in assessing trainees' handoff skills.

Introduction

Handoffs, the “process of transferring primary authority and responsibility for providing clinical care to a patient from 1 departing caregiver to 1 oncoming caregiver,”¹ have been demonstrated to be a significant causative factor in medical errors.²

Educators have noted that feedback³ and assessment⁴ are essential facilitators of learning.⁵ The Accreditation Council for Graduate Medical Education (ACGME) requires programs to monitor handoffs⁶ to ensure resident competence in this vital communication skill. To provide effective resident monitoring, programs will need handoff feedback and assessment tools.

Although we identified 3 systematic reviews focused on studies of handoff curricula,^{7–9} none focused on handoff feedback or assessment tools. Therefore, we conducted a systematic review of the published English-language literature to identify and assess published research on these tools.

Methods

Literature Search

An experienced medical librarian (E.M.J.) conducted a comprehensive literature search for English-language articles published on inpatient, shift-to-shift handoffs between January 1, 2008, and May 13, 2015, in Ovid MEDLINE, Ovid MEDLINE In-Process & Other Non-Indexed Citations, Journals@Ovid, CINAHL (EBSCOhost), and “ePub ahead of print” in PubMed. We chose relevant controlled vocabulary and keywords to capture the concepts of handoff, including its multiple synonyms (provided as online supplemental material).

All article titles were independently reviewed for inclusion by at least 2 trained reviewers (from the following group: J.D., C.E., M.M., L.A.R.). If either reviewer selected a reference, the full text was ordered for further review. Using this strategy, 1497 articles were obtained. The percent agreement on initial independent selection of articles for further review was 94%. Interrater reliability using Cohen's kappa was $\kappa = 0.72$ ($P < .001$).

All full-text articles were reviewed by teams of 2 trained reviewers (from the following: J.D., C.R., C.E., M.M.). In cases where reviewers disagreed, articles were discussed by the team until consensus was reached. To identify other relevant articles, the reference sections of all included articles were

DOI: <http://dx.doi.org/10.4300/JGME-D-16-00168.1>

Editor's Note: The online version of this article contains a table of literature search methods and an annotated bibliography of handoff feedback and evaluation tools.

checked by 2 independent research assistants (C.E. and M.M.).

Inclusion and Exclusion Criteria

At the outset, we developed a comprehensive systematic review protocol, including operational definitions, inclusion and exclusion criteria, and search strategy details. Feedback was defined as any formative process of providing information or constructive criticism that could help improve handoff performance. Assessment was defined as a summative process of assessing performance related to knowledge, content, attitudes, behaviors, or skills.

Articles meeting the following criteria were eligible for review: included medical students, residents, fellows, or attending physician's inpatient, shift-to-shift handoffs; had either quantitative or qualitative research data; and the research focused on feedback or assessment tools aimed at the learner. Exclusion criteria included articles that focused on interhospital or intrahospital transfer, were anecdotal or had no data, or were letters to the editor, commentaries, editorials, or newsletter articles.

Abstraction Process

The team used an iterative process to develop and pilot test an abstraction form designed to confirm final eligibility for full review, assess article characteristics, and extract data relevant to the study. Each article was independently abstracted by 2 of 3 trained reviewers (J.D., C.E., M.M.). The 2 abstractors, along with an author independent to the abstraction process (L.A.R.) discussed and combined the 2 abstractions into a final version. All abstraction disagreements were minor and were resolved during discussions between the reviewers.

Quality Assessment

The team used the Medical Education Research Study Quality Instrument (MERSQI) developed by Reed et al¹⁰ to assess quality. It is an 18-point, 6-domain instrument designed specifically for medical education research. The 6 domains are study design, sampling, type of data, validity of assessment instruments' scores, data analysis, and outcomes evaluated. Since its introduction in 2007, multiple studies have shown evidence of its validity and reliability.^{10–12} Studies were quality scored on each item via team consensus to arrive at final MERSQI scores. As described in its original use,¹⁰ the total MERSQI score was calculated as the percentage of total achievable points. This percentage was then adjusted to a standard

denominator of 18 to allow for comparison of MERSQI scores across studies.

Response rate is the proportion of those eligible who completed the posttest or survey. For intervention studies, this is the proportion of those enrolled who completed the intervention assessment. For outcomes, handoff demonstration measures were considered skill acquisition if the handoff measure was done once during an intervention, and behavioral demonstration if there were multiple measurements over time in an actual health care setting. If a study measured multiple levels of outcomes, it was given the score corresponding to the highest level of outcome it measured.

Types of Data Reported

We categorized data reported into 4 types: *content*, *process*, *handoff organization*, and *professionalism*. These were defined as (1) *content*, which describes items included in the handoff related to a patient's health-related history, treatment management or planning, or hospital course or updating these items; (2) *process*, which evaluates or assesses environmental or other components of a quality handoff (eg, limiting interruptions, quiet location); (3) *handoff organization*, which describes adherence to a predefined order of handoff items, patients to be handed off, or coherence and understandability of handoff presentation; and (4) *professionalism*, which describes provider conduct and appropriateness in the health care setting and relationships with colleagues.

Validity evidence was grouped according to the 5-category validity framework developed by Beckman et al¹³ and expanded by Cook and Lineberry¹⁴: *content*, *internal structure*, *response process*, *relationships with other variables*, and *consequences*.

Content included face validity, adapting items from an existing instrument, stakeholder review, literature search, or previous publication. *Internal structure* included all forms of reliability, factor analysis, or internal consistency. Pilot testing was included as part of *response process*, whether data of the pilot were reported or not. *Relationships with other variables* was shortened to "relational" and included correlation to any outside factor or tool. *Consequences* included any potential objective change or outcome (regardless of whether there was a change or not and regardless of whether the change was intended or not) after feedback or assessment was implemented, as well as any impact on the evaluator or evaluatee.^{13,14}

Results

Our search strategy yielded 10 774 unique articles (total with duplicates 13 019). After reviewing the

search, we identified 26 articles (32 tools) published between January 1, 2008, and May 13, 2015, that focused on inpatient handoff feedback or assessment tools (FIGURE). Of these articles, 3 were relevant to feedback only,^{27,29,34} 8 to assessment only,^{15,18,19,21,23,31,33,35} and 15 to feedback and assessment (TABLES 1 and 2).^{16,17,20,22,24–26,28,30,32,36–40} Copies of some tools are available from the authors on request.

The mean quality score of the studies was 12.2 (SD = 2.4; range = 7–16.5; possible maximum = 18). The consistently lowest-scoring domains were study design (mean = 1.5, SD = 0.62), outcome (mean = 1.7, SD = 0.42), and sampling (mean = 1.7, SD = 0.54). Ten studies (38%) reported funding; however, the mean quality score was identical for funded and unfunded studies (12.2).

Most of the studies occurred in the United States (22 of 26, 85%).^{15–34,37,40} Only 2 studies occurred entirely outside of the United States,^{35,36} and 2 more occurred in both Canada and the United States.^{38,39} There were several different types of study designs among the articles. The study design most commonly used was pre-post intervention (11 of 26, 42%).^{15,17,24,28,30,32,33,36–39} Other study designs included validity evidence only (6 of 26, 23%)^{19,21,26,29,31,35}; randomized control trial (2 of 26, 7.7%)^{16,25}; posttest study (2 of 26, 7.7%)^{20,40}; observational study (2 of 26, 7.7%)^{18,23}; and matched group design with random assignment to control and trained groups (1 of 26, 3.8%).²² The studies included the specialties of internal medicine (12 of 26, 46%)^{15,16,18,19,23–27,31,34,37}; pediatrics (3 of 26, 12%)^{33,38,39}; pediatric cardiac critical care (1 of 26, 3.8%)²¹; surgery (1 of 26, 3.8%)²⁹; emergency medicine (1 of 26, 3.8%)³⁶; and gastroenterology (1 of 26, 3.8%).⁴⁰ Several of the studies used participants from more than 1 specialty (7 of 26, 27%).^{17,20,23,28,30,32,35} The participants involved in the most studies were interns and residents (21 of 26, 81%)^{15–18,20,22–27,29–34,36–39} but also included attending physicians (7 of 26, 27%),^{19,21,27,31,36,38,40} fellows (2 of 26, 7.7%),^{21,40} medical students (2 of 26, 7.7%),^{27,28} nurse practitioners (1 of 26, 3.8%),³¹ and physician assistants (1 of 26, 3.8%).³¹ One study focused on physicians but also included pharmacists, nurses, psychologists, and educators (1 of 26, 3.8%).³⁵

Feedback

Feedback methods varied. Most often, feedback was provided 1-on-1 to learners (15 of 18, 83%).^{17,20,22,24,25,28–30,32,34,36–40} However, 17% (3 of 18) of the articles reported that feedback was

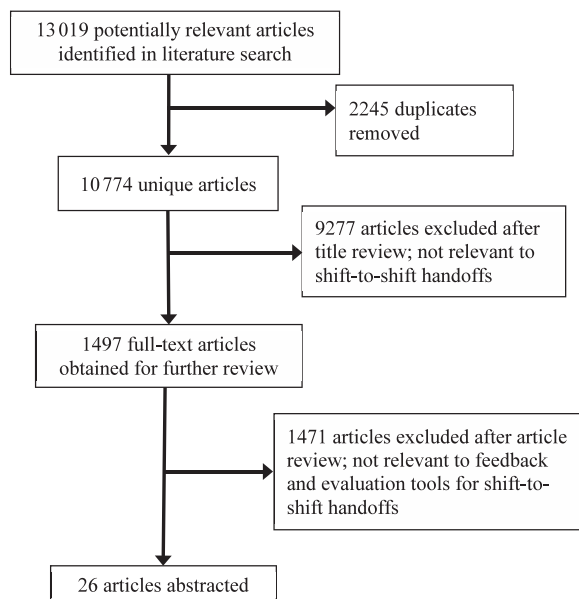


FIGURE
Study Selection Process for a Systematic Review of the Literature (2008–2015) on Feedback and Assessment Tools for Shift-to-Shift Handoffs

provided in group sessions as part of an intervention or curriculum.^{16,26,27} All but 1 article with feedback²⁶ showed statistically significant improvements in at least 1 component assessed.

The most commonly used method was to provide feedback to the learner once or during 1 session (11 of 18 studies, 61%).^{18,22,26,28–30,32,37–40} Some studies provided feedback to learners more than once (7 of 18 studies, 39%).^{16,20,24,25,27,34,36} Studies providing feedback over time showed varied results, ranging from significant increases in handoff provider satisfaction with personal verbal handoff quality preintervention to postintervention²⁰ and significant improvements on all measured content and organization (2 of 3, 67%)²⁹ to mixed results, with some elements improved (inclusion of advanced directives and anticipatory guidance) and no improvement in organization nor readability (1 of 3, 33%).²⁴

Of the 18 studies, 3 (17%) provided feedback for several weeks or months.^{24,27,34} All reported some improvements over time, with 1 study documenting statistically significant improvement in overall quality score.²⁷

Feedback provided to the learners usually included content of the handoff (17 of 18, 94%).^{16,17,20,24–30,32,34,36–40} All studies measuring content compared to a control or preintervention group showed an improvement.^{16,24,27,30,36,39} A few studies provided feedback on the process of the handoff (6 of 18, 33%).^{16,20,28,37–39}

TABLE 1

Brief Summary of Articles Included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (2008–2015)

Author, y (Country)	Study Design and Sample	Feedback or Assessment	Outcome/Result Measured	Funding	Quality Score
Aboumatar et al, ¹⁵ 2014 (US)	Pre-post intervention study Internal medicine interns (39 [98%] completed the sign-out success peer partner assessment, 36 [92%] end of workshop self-assessment, and 27 [69%] 3-month postworkshop survey)	Assessment	Peer- and self-assessed confidence and quality	Reported none received	10.5
Airan-Javia et al, ¹⁶ 2012 (US)	Randomized control observation Internal medicine interns (n = 44) and residents (n = 24) completed education; 24 interns in the intervention group and 20 interns in the control group	Feedback and assessment	Verbal and electronic content and quality scores	Reported none received	13.5
Allen et al, ¹⁷ 2014 (US)	Pre-post intervention study Multispecialty residents	Feedback and assessment	Participant perception	Reported none received	9
Aroia et al, ¹⁸ 2013 (US)	Prospective observational cohort study 39 of 40 (98%) internal medicine interns participating were evaluated at least 1 time; 31 (78%) returned 172 of 288 (60%) peer assessments	Assessment	Handoff performance, including process, content, and summary score	Project-supported grants	13.5
Aroia et al, ¹⁹ 2014 (US)	Validity evidence study 47 internal medicine faculty members; 172 of 191 (90%) possible observations	Assessment	Several forms of reliability and validity	Project- and author-supported grants	14
Aylward et al, ²⁰ 2014 (US)	Posttest study 25 of 32 (78%) internal medicine and medicine-pediatrics interns assessed on general medicine ward; total of 105 assessments	Feedback and assessment	Handoff ability and competence	Reported none received	11
Bates et al, ²¹ 2014 (US)	Validity evidence study, with tool development; video simulation testing; in situ testing Pediatrics cardiac critical care attendings and fellows; 10 participated in simulation testing and 29 in situ testing	Assessment	Reliability, validity, and feasibility	Author-supported grants	13.1
Britt et al, ²² 2015 (US)	Matched group design with random assignment to control and trained groups 10 surgical and 22 pediatrics interns	Feedback and assessment	Summary score and subscale analysis	No funding statement	14.5
Bump et al, ²³ 2011 (US)	Prospective observational cohort study 24 internal medicine interns observed, with a total of 124 patient handoffs observed	Assessment	Sign-out content and organization, handoff duration	No funding statement	12.0
Bump et al, ²⁴ 2012 (US)	Pre-post intervention study Internal medicine interns; 128 sign-outs before and 177 sign-outs during the intervention	Feedback and assessment	Content, organization, readability, summary score	No funding statement	13.1

TABLE 1

Brief Summary of Articles Included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (continued)

Author, y (Country)	Study Design and Sample	Feedback or Assessment	Outcome/Result Measured	Funding	Quality Score
Bump et al, ²⁵ 2012 (US)	Randomized control observation 224 written patient sign-outs from 31 internal medicine interns were evaluated by faculty	Feedback and assessment	Sign-out content, organization, and summary score	Reported none received	15.8
Dine et al, ²⁶ 2013 (US)	Validity evidence study 62 internal medicine interns; 538 of 915 (59%) possible assessments completed over 61 days	Feedback and assessment	Intervention: validity, generalizability, participant satisfaction Learner satisfaction survey: content, process, summary score, overall competency	Project- and author-supported grants	12.5
Doers et al, ²⁷ 2015 (US)	Prospective quality improvement project, with pre-post intervention study Internal medicine attendings, residents, and medical students; 184 preintervention and 229 postintervention assessments	Feedback	Content quality, summary score	Reported none received	11.0
Farnan et al, ²⁸ 2009 (US)	Pre-post intervention study 32 of 34 (94%) fourth-year medical students	Feedback and assessment	Mean overall sign-out competence, content quality, pre- and postsurvey on handoff preparedness	Project- and author-supported grants	8.0
Filichia et al, ²⁹ 2011 (US)	Validity evidence study 26 surgical residents	Feedback	Critical information discovery, proof of concept	No funding statement	9.3
Gakhar and Spencer, ³⁰ 2010 (US)	Pre-post intervention study 14 internal medicine interns observed carrying out 100 sign-outs preimplementation and 12 internal medicine and emergency medicine interns observed carrying out 61 sign-outs postimplementation; accuracy check of 28 random sign-outs both preimplementation and postimplementation	Feedback and assessment	Curriculum satisfaction, content, completeness, legibility, accuracy	Reported none received	14.5
Horwitz et al, ³¹ 2013 (US)	Validity evidence study Internal medicine attending physicians, nurse practitioners, physician's assistants, and residents; 149 observed handoff sessions with 97 unique individuals involved; assessment completed for 343 handoff providers and 330 handoff recipients	Assessment	Several forms of reliability and validity; peer compared to observer evaluations	Project- and author-supported grants	14.2
Johnson et al, ³² 2015 (US)	Pre-post intervention study 52 pediatrics and medicine-pediatrics residents	Feedback and assessment	Content, perceived patient safety, summary score, rapid response calls, and transfers to intensive care unit (simulated patient outcomes)	Reported none received	9.0

TABLE 1
Brief Summary of Articles Included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (continued)

Author, y (Country)	Study Design and Sample	Feedback or Assessment	Outcome/Result Measured	Funding	Quality Score
McCrory et al, ³³ 2012 (US)	Pre-post intervention study 26 pediatrics interns; 52 handoffs	Assessment	Content, organization, summary score, handoff duration	Reported none received	14.0
O'Horo et al, ³⁴ 2012 (US)	Nonrandomized control observation Internal medicine interns and residents; 3184 patient sign-outs	Feedback	Completeness, accuracy, and perceived safety of care	Reported none received	12.5
Pezzolesi et al, ³⁵ 2013 (UK)	Validity evidence study 30 member expert panel (physicians, nurses, pharmacists, psychologists, educators) reviewed items; 4 raters scored 10 pediatric and 10 gynecology patient handoffs; 62 consultants from various disciplines viewed and scored a "good" and a "poor" handoff video simulation	Assessment	Several forms of reliability and validity	Project-supported grant	11.5
Rudiger-Stürchler et al, ³⁶ 2010 (Switzerland)	Pre-post intervention study Emergency medicine attending physicians (9) and residents (11)	Feedback and assessment	Content, handoff duration, wrong or missing information and perceived consequences, overall quality of handoff	No funding statement	12.5
Sawatsky et al, ³⁷ 2013 (US)	Pre-post intervention study 11 internal medicine interns	Feedback and assessment	Content, handoff duration, average completed tasks	No funding statement	13
Starmer et al, ³⁸ 2014 (US, Canada)	Pre-post intervention study 855 pediatrics residents; 888 faculty handoff observations	Feedback and assessment	Self-reported ability, curriculum effectiveness	Project-supported grant	7
Starmer et al, ³⁹ 2014 (US, Canada)	Pre-post intervention study 875 pediatrics residents; 432 written handoffs of 5752 unique patient handoffs and 207 oral handoffs of 2281 unique patients	Feedback and assessment	Patient outcomes, content, workflow, participant satisfaction	Project- and author-supported grants	16.5
Williams et al, ⁴⁰ 2011 (US)	Posttest study Gastroenterology attendings and fellows	Feedback and assessment	Handoff communication tasks, assessment tasks, management tasks	Project-supported grant	11.5

TABLE 2
Description of Tools and Education Included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (2008–2015)

Author, y	Feedback or Assessment	Tool or Mechanism Used	Validity Evidence	Education
Aboumatar et al, ¹⁵ 2014	Assessment	Self-assessment: 6-item sign-out success (5-point Likert scale, strongly disagree to strongly agree) Peer-assessment: 7-item received sign-out tool (5-point Likert scale, strongly disagree to strongly agree)	None described	4-hour workshop, with 2 hours for sign-out and 2 hours for transition home; included role play, didactics, videotaped demonstrations, and peer- and self-assessment
Airan-Javia et al, ¹⁶ 2012	Feedback and assessment	Handoff evaluation tool (HET): 20 items in 3 parts (open-ended, yes/no, and yes/partial/no questions) Verbal and written handoff checklist: residents provided feedback using a 12-item safe handoff elements reference card (dichotomous yes/no)	Content, internal structure, consequences	1-hour educational session: 45-minute lecture for interns and residents and 15-minute feedback training session for residents who were asked to observe and provide feedback to interns 2 times over 2 weeks
Allen et al, ¹⁷ 2014	Feedback and assessment	Checklist based on ICATCH ^a mnemonic: 6 items that describe content that should be included for each letter of the mnemonic (dichotomous)	Content	Didactic lecture; mnemonic; small group discussion; observed simulated handoff experience (OSHE)
Arora et al, ¹⁸ 2013	Assessment	Peer-assessment tool based on the handoff clinical evaluation exercise (CEX): 6 domains addressing all core competencies, 14 items total (9 items with 9-point Likert scale [6 items anchored at each end with behavioral descriptors, plus 3 items: overall competence, evaluator satisfaction, and evaluatee satisfaction]); remaining items categorical or free text	Content, internal structure, response process, relational, consequences	45-minute lecture on handoffs
Arora et al, ¹⁹ 2014	Assessment	Handoff mini-clinical examination exercise (CEX): 3 domains plus overall quality, 4 items (9-point Likert scale with 3 of 4 items anchored at each end with behavioral descriptors)	Content, internal structure, response process	Brief introduction to the importance of handoffs
Aylward et al, ²⁰ 2014	Feedback and assessment	Milestone-based handoff observation assessment form designed to assess the entrustable professional activity (EPA) of handoffs: 8 items (5 levels with behavioral descriptors for each level)	Content, response process, consequences	90-minute handoff workshop for interns; rater training
Bates et al, ²¹ 2014	Assessment	Patient Knowledge Assessment Tool (PKAT) mnemonic: 9-item checklist	Content, internal structure, response process, relational	N/A

TABLE 2
Description of Tools and Education included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (continued)

Author, y	Feedback or Assessment	Tool or Mechanism Used	Validity Evidence	Education
Britt et al, ²² 2015	Feedback and assessment	Global Assessment Scale: 6-item (5-point Likert scale) with some behavioral anchors plus summary score	Content, internal structure	Interactive lecture followed by exercises with case scenario discussion; then, conducted handoffs and received feedback during session; trained group received aforementioned education before standardized patient encounters and control group received education after standardized patient encounters
Bump et al, ²³ 2011	Assessment	Written sign-out evaluation rubric: 10-item scale, with dichotomous descriptive anchors	Content, consequences	N/A
Bump et al, ²⁴ 2012	Feedback and assessment	Faculty feedback form for sign-out evaluation: 9-item (5-point Likert-type scale)	Content, internal structure, response process, consequences	1-page handout; SIGNOUT ^b mnemonic; weekly sign-out review and feedback
Bump et al, ²⁵ 2012	Feedback and assessment	Checklist for evaluating written sign-out: 10-item (9 items dichotomous [present/absent] and 1 item with 9-point Likert scale)	Content, response process, relational, consequences	Control group received a 30-minute lecture, 1-page handout, SIGNOUT ^c mnemonic; intervention group received all of aforementioned, plus additional instruction, face-to-face feedback, and copies of completed checklists
Dine et al, ²⁶ 2013	Feedback and assessment	Peer assessment of inpatient handoffs: 8-item (6 items with 9-point Likert scale, with 3 behavioral anchors, plus 1 item on a 9-point Likert scale [overall competency score] that did not have behavioral descriptors and 1 item for comments)	Content, internal structure, response process, relational	2-hour workshop with lecture; simulation; small group discussion with feedback
Doers et al, ²⁷ 2015	Feedback	Sign-out quality checklist: 11-item (dichotomous yes/no)	Content, response process, consequences	5-minute PowerPoint presentation; poster with essential components; ongoing feedback
Farnan et al, ²⁸ 2009	Feedback and assessment	Handoff clinical examination exercise (CEX): 6 domains addressing all core competencies; 14 items total (9 items with 9-point Likert scale [6 items anchored at each end with behavioral descriptors, plus 3 items: overall competence, evaluator satisfaction, and evaluatee satisfaction]), remaining items categorical or free text	Content	90-minute interactive workshop; electronic access to education materials; pocket card; observed simulated handoff experience (OSHE)

TABLE 2
Description of Tools and Education Included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (continued)

Author, y	Feedback or Assessment	Tool or Mechanism Used	Validity Evidence	Education
Filichia et al, ²⁹ 2011	Feedback	Virtual People Factory computer simulation platform	Content, response process	N/A
Gakhar and Spencer, ³⁰ 2010	Feedback and assessment	Spoken sign-out SIGNOUT ^d checklist: 7-item (dichotomous yes/no) based on mnemonic Written sign-out 8-item checklist on completeness and accuracy (dichotomous yes/no)	Content, internal structure, response process, consequences	30-minute lecture; mnemonic; interactive small group session with feedback; printed version of mnemonic; residents scoring handoffs were trained
Horwitz et al, ³¹ 2013	Assessment	Handoff clinical evaluation exercise (CEX; start of shift or provider); 7 items (6 items with 9-point Likert scale anchored at each end with behavioral descriptors; plus an overall quality score, with a 9-point Likert score, but without behavioral anchors), plus 3 check-off items and a comment section Handoff CEX (end of shift or recipient): 6 items (5 items with 9-point Likert scale anchored at each end with behavioral descriptors plus an overall quality score, with a 9-point Likert score but without behavioral anchors), plus 3 check-off items and a comment section	Content, internal structure, relational	N/A
Johnson et al, ³² 2015	Feedback and assessment	11-item checklist (dichotomous) of crucial elements	Content, consequences	Computer-based simulation modules with feedback; peer-to-peer feedback; structured education involved facilitator reading a 5-paragraph summary
McCrary et al, ³³ 2012	Assessment	Handoff scoring tool: 10-item (dichotomous yes/no)	Content, internal structure, consequences	45-minute didactic session and mnemonic; simulated handoff
O'Horo et al, ³⁴ 2012	Feedback	Standard feedback report on 8-item content inclusion/exclusion (dichotomous)	Consequences	Group and individual education sessions: monthly education sessions on electronic system and quality handoffs; weekly residents received a standard feedback report; total time reported as 45 minutes per week
Pezzolesi et al, ³⁵ 2013	Assessment	Handover performance tool (HPT): 25 items (5-point Likert scale with 3 factors (communication, teamwork, situational awareness)	Content, internal structure, relational	N/A
Rudiger-Stürchler et al, ³⁶ 2010	Feedback and assessment	dINAMO ^e mnemonic feedback checklist (5 items) and 18-item postrounds assessment tool	Content, internal structure, consequences	5-minute instruction, with 1-to-1 feedback after handoff sessions
Sawatsky et al, ³⁷ 2013	Feedback and assessment	9-item checklist based on SIGNOUT ^f mnemonic (dichotomous yes/no)	Content, consequences	45-minute didactic session with deliberate practice; mnemonic; sign-out practice with direct performance feedback; pocket card with mnemonic

TABLE 2
Description of Tools and Education Included in a Systematic Review of Feedback and Assessment Tools for Shift-to-Shift Handoff (continued)

Author, y	Feedback or Assessment	Tool or Mechanism Used	Validity Evidence	Education
Starmer et al, ³⁸ 2014	Feedback and assessment	3 I-PASS ⁹ observation and feedback tools: Printed Handoff Document Assessment Faculty Observation Tool (22 items); Verbal Handoff Faculty Observation and Feedback Tool (18 items); and Verbal Handoff Faculty Observation and Feedback Tool for Receiver (9 items); all with a combination of dichotomous, Likert scale, and comment sections	Content, internal structure, response process	3 hours total: 2-hour workshop; 1-hour interactive activities (role play, video, simulation), with feedback; computer module
Starmer et al, ³⁹ 2014	Feedback and assessment	3 I-PASS ⁹ tools as described for Starmer et al, ³⁸ 2014	Content, internal structure, response process, consequences	3 hours total: 2-hour workshop; 1-hour role play and simulation with feedback; video; computer module; logo; posters
Williams et al, ⁴⁰ 2011	Feedback and assessment	Observed standardized clinical examination (OSCE) checklist: 23 items (dichotomous [not done/done] and categorical [not done/partly done/done])	Content, internal structure	Articles on handoffs to read

Abbreviation: N/A, not applicable.

^a ICATCH, i: identify (name, medical record number, date of admission, code status); C: chief complaint or presenting symptoms; A: active problem list; T: therapies and interventions (planned for next 24 hours); C: clinical trajectory and condition (sick or not sick; response to therapy and help the receiving caregiver anticipate problems); H: help me (encourage questions and dialogue).

^b SIGNOUT, S: sick or not sick, do not resuscitate orders; I: identifying patient information (name, MR#); G: general hospital course (reason for admission); N: new events of the day; O: overall health status—getting better or worse; U: upcoming possibilities for plan, rationale; T: tasks to complete overnight.

^c SIGNOUT, S: sick or not sick; I: identifying patient information; G: general hospital course; N: new events of the day; O: overall health status; U: upcoming possibilities with a plan and rationale; T: tasks to complete overnight.

^d SIGNOUT, S: sick or “do not resuscitate” status; I: identification data; G: general hospital course; N: new events of the day; O: overall health; U: upcoming possibilities; T: tasks to do.

^e DINAMO, d: doctor, remember; I: identify (age, sex, name); N: needs of the patient (chief complaints) A: analysis (state of the evaluation); M: medical management (planned evaluation or treatment); O: organization (planned transfer, discharge).

^f SIGNOUT, S: sick/not sick or code status; I: identifying data; G: general hospital course; N: new events of the day; O: overall health status; U: upcoming possibilities with plan and rationale; T: tasks to complete with plan and time for questions.

⁹ I-PASS: I: illness severity; P: patient summary; A: action list; S: situation awareness and contingency plans; S: synthesis by receiver.

Varied outcomes of explicit content were measured after feedback. Code status was the most frequent item that showed statistically significant improvement in inclusion during handoffs after feedback.^{24,30,37,39} Other items that were often statistically improved after feedback were medications,^{16,30,39} anticipatory guidance,^{24,27,30,34,37,39} and diagnostic tests/results.^{27,36,39} Occasionally, some content items were omitted more frequently after feedback, such as major medical problems¹⁶ or asking if the receiver had any questions.³⁵

Assessment

The assessment process was measured in heterogeneous ways across studies. The Handoff Clinical Evaluation Exercise (CEX) or tools based on it were the most commonly used.^{18,19,28,31} Articles with assessment tools used several types of outcome measures, including content-based (22 of 23, 96%)^{15–21,23–26,28,30–33,35–40}; process-based (11 of 23, 48%)^{16,18–20,28,31,35,37–40}; perception of professionalism (11 of 23, 48%)^{18–20,22,26,28,31,35,38–40}; and organizational measures (17 of 23, 74%).^{15,16,18–20,21–26,28,31,33,35,38,39}

Five articles included more than 1 assessment tool (TABLE 2): 1 with self-perception and receiver-perception of handoff¹⁵; 1 with verbal and written assessment³⁰; 1 with separate tools for the giver and receiver³¹; and 2 with 3 tools (1 each for printed, verbal giver, and verbal receiver).^{38,39} One study used a single tool in a global assessment of a trainee in roles of both sender and receiver.¹⁸

Feedback and Assessment

In 7 studies, the person providing feedback and/or assessment received training.^{16,25,28,30,37–39} Of the studies that contained both feedback and assessment, 4 had tools exclusively for feedback,^{16,36,38,39} although many studies used their assessment tools as a feedback guide.^{17,20,23,24–28,30,33}

Seven studies assessed the accuracy of handoff content with 4 embedding this in the tool,^{20,25,38,39} 2 by independent retrospective chart review,^{30,34} and 1 by querying senior faculty.³⁶ In addition, 7 studies used tools that assessed whether or not the content of the handoff was updated.^{16,18,23–26,37}

Learners were evaluated using audiotapes¹⁶ and videotapes^{24,33,37} in several studies. In 2 of the studies using videotape, learners were able to review the recordings for educational purposes.^{33,37} Two studies used real patient handoffs, 1 with audiotape¹⁶ and 1 with videotape,³⁷ and 2 used simulated handoffs.^{22,33} All 4 demonstrated significant improvements, either in pre- to postcomparisons^{33,37} or when compared to

a control group.^{16,22} The observed simulated handoff experience was used in 2 studies,^{17,28} and the objective standardized clinical examination was used in 1 study.⁴⁰ Overall, 9 studies used some form of simulation, standardized patient encounter, or standardized resident encounter.^{17,22,26,28,32,33,38–40} Three studies used a combination of educational/simulation and workplace testing.^{37–39}

Six articles focused solely on describing or offering validity evidence for a tool.^{19,21,26,29,31,35} Other studies, not specifically aimed at validation, also reported various types of validity evidence (TABLE 2). Eight articles used behavioral anchors for at least some levels of tool items,^{18–20,22,23,26,28,31} with 2 using anchors for all levels.^{20,23}

Discussion

Our systematic review of the literature yielded 26 articles and 32 tools relevant to feedback and assessment of inpatient handoff communication. The interventions and outcomes measured varied widely across the studies. As expected, most articles showed that using feedback and/or assessment improved the content or organization measures included in the respective tools. Process and professionalism measures were less reliably improved. Two studies measured perceived safety,^{32,34} and 1 study measured actual patient outcomes (medical errors and adverse events).³⁹

Handoff communication errors have been linked to adverse patient outcomes, which has led to a national focus on the need to improve handoff communication. However, the existing literature on handoff feedback and assessment tools has not demonstrated a clear link between use of these tools and improved patient outcomes. Although Starmer and colleagues³⁹ demonstrated improved patient outcomes, their study included a bundle of interventions (not solely the use of a handoff feedback/assessment tool). There is no clear link between use of the tool itself and patient outcomes.

The tools identified were diverse. One reason for this is that different specialties and institutions may require different types of handoffs with different relevant information. To address this, some handoff experts have proposed the concept of *flexible standardization*, a core set of universally accepted components that can be modified for a specific institution or specialty as needed.^{41–43} This would apply to feedback and assessment tools. In addition, patient handoffs must provide a balance between consistent content and necessary flexibility in diverse

patient scenarios. Feedback and assessment tools should address this dynamic tension.

The Handoff CEX or tools based on it are the most widely studied tools we identified; however, even these tools require further research to confirm their effectiveness. Due to the recent nature of this body of literature (2009–2015), and the relatively small number of studies (26) and tools identified (32), it is too early to definitively identify the best tools for particular disciplines and/or learner levels. We hope that with time and further study a rich body of feedback and assessment tools for handoffs will develop.

Overall, the items included in the assessment tools were mainly content based, followed by organizational measures. Professionalism and process-based measures were used less often in evaluating learners. If the goal of providing feedback and/or assessment is to improve handoff content, then checklist tools assessing presence/absence will suffice. However, we believe that there are factors other than content that make a quality handoff. While process, organization, and professionalism can be assessed using dichotomous (yes, no) or categorical (never, rarely, occasionally, usually, always) scoring, learners may benefit more from tools with descriptive behavioral anchors. We identified 8 tools with at least some behavioral anchors.^{18–20,22,25,26,28,31}

Handoff is a skill that requires deliberate practice in order to master. In fact, it is 1 of the most important skills for incoming interns to learn before residency.⁴⁴ Simulation, standardized patient encounters, and role play would be ideal modalities for safely teaching and assessing this important skill. Indeed, 9 of 26 (35%) studies in this review used some form of simulation or standardized encounter.^{17,22,26,28,32,33,38–40} One of these 9 studies (11%)²⁸ used medical students, and 3 (33%)^{22,26,33} specifically mentioned including interns. In the future, the use of simulation or objective standardized clinical examinations to assess graduating medical student and intern competency in handoffs may help ensure patient safety.

It is recognized that regular feedback is important in the acquisition of clinical skills.^{3,45} However, only 39% (7 of 18) of feedback articles provided feedback more than once. One study³⁴ introduced a new electronic handover system and showed that implementing the electronic system without feedback increased omissions of both allergies and code status. When feedback was implemented, allergy and code status omissions were reduced, and an improvement was seen in inclusion of patient location, patient identification information, and anticipatory guidance.³⁴ Doers et al²⁷ suggested

that providing feedback to medical students, residents, and attending physicians once a month was an effective way to sustain improvements in handoff quality, and Dine et al²⁶ showed that at least 10 peer assessments during a single rotation and 12 to 24 across multiple rotations were needed to adequately assess handoff skills. Clearly, more research is needed to answer the question about how much feedback is sufficient.

Handoffs require mastery of a complex set of diverse skills (eg, communication, teamwork, prioritization, organization). Aylward and colleagues²⁰ identified handoffs as an example of an entrustable professional activity (EPA), an activity requiring multiple tasks and responsibilities that faculty can progressively entrust learners to perform independently.⁴⁶ Handoffs, viewed as EPAs, require feedback over time; however, this will require adequate faculty development and time to provide the needed feedback and assessment. This creates an entirely new set of issues, as faculty may have different ideas about what constitutes an effective versus ineffective handoff. In addition, effective feedback requires specific skills that faculty may not possess. Finally, there are competing demands on faculty time. Each of these will need to be addressed by medical education leadership.

Who evaluates learners may play a role in the validity and reliability of the assessment. Of the 26 studies, 7 explicitly stated that the person providing assessment or feedback received training.^{16,25,28,30,37–39} Using standardized videos and the Handoff CEX tool, Arora et al¹⁹ found that internal medicine faculty could reliably discriminate different levels of performance in each domain. Peer assessments, while feasible, show evidence of leniency,^{18,31} and their impact on resident workload is unclear.¹⁸ These studies suggest that well-trained or experienced external observers are necessary to ensure adequate assessment of learners' handoff skills.

Funding is an important consideration in medical education studies, and it can impact study quality.¹⁰ However, in our study the mean quality score was 12.2 (possible range = 1–18) for funded and unfunded research. Less than half of the studies reported receiving project or author funding (10 of 26, 39%), and only 1 of the funded studies measured patient outcomes. Showing benefit to patients is the ultimate goal; however, funding studies that measure this can be quite expensive. It will be important in the future to identify handoff measures that are proven to both improve the handoff itself and translate into improved patient safety.

This review is limited by the search strategies used. Some relevant studies may have been quality improvement studies, which may not be reported in the peer-reviewed literature.⁴⁷ Although our comprehensive search strategy to identify relevant articles minimizes the risk of missing germane articles, it does not eliminate the possibility. Finally, the heterogeneity of the studies in both methodology and interventions limits the conclusions that can be drawn.

Conclusion

We identified 26 studies on handoff feedback and assessment containing 32 tools. These tools were exclusively hospital based but spanned many specialties. No single tool arose as best for any particular specialty or use. Assessment and ongoing feedback are important components for improving physician handoffs. The tools we identified or their components can be used as templates for medical educators wishing to develop handoff feedback and assessment tools that incorporate institutional and specialty-specific needs.

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REVIEWS

Funding: Catherine Roach was supported by a Foundation for Anesthesia Education and Research Medical Student Anesthesia Research Fellowship. This research was partially supported by the University of Alabama at Birmingham Medical Student Summer Research Program (NIH/NHLBI T35HL007473).

Conflict of interest: The authors declare they have no competing interests.

Some preliminary data were presented at the Minority Health Disparities Resource Center Summer Research Display, Birmingham, Alabama, July 2014; the Dale J. Benos Medical Student Research Day, Birmingham, Alabama, October 28, 2014; the American Society of Anesthesiologists Conference, San Diego, California, October 24, 2015; and the Accreditation Council for

Graduate Medical Education Annual Educational Conference, National Harbor, Maryland, February 26, 2016.

The authors would like to thank Amos J. Wright, medical librarian, Department of Anesthesiology and Perioperative Medicine, University of Alabama at Birmingham.

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Received March 14, 2016; revisions received June 13, 2016, and August 2, 2016; accepted September 13, 2016.