


# Design and Implementation of a Pathology-Specific Handoff Tool for Residents

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## Abstract

Miscommunication is a source of clinical errors. Tools to decrease the risk of miscommunication (ie, patient handoff tools) are routinely used in clinical specialties that see patients but not routinely used in pathology residency programs. Our primary goal was to develop a structured handoff tool for pathology residents useful for both patient-specific communication and information about general laboratory operation with a secondary goal to increase resident confidence in on-call situations. The CATCH tool was developed and implemented in a pathology residency program with a pre- and postimplementation survey given to residents. The structured handoff tool for pathology residents provided consistent and timely communication between residents and attending physicians. Resident confidence with pathology on-call issues was more likely related to progression through the residency training program rather than implementation of a structured handoff tool.

## Keywords

graduate medical education, handoff, pathology, resident, on-call, communication

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## Introduction

Medical error is a significant source of all-cause mortality in the United States and miscommunication is a leading cause of the errors.<sup>1,2</sup> Patient handoffs and sign-out of clinical information between providers are a consistent source of communication failures in the hospital.<sup>3</sup> Consequently, the Joint Commission requires a standardized approach to patient care to help decrease the risk for miscommunication errors, while the Accreditation Council for Graduate Medical Education requires that residency programs provide formal instruction regarding patient handoffs with attending faculty monitoring of resident handoffs.<sup>4-6</sup> There is no standardized method for patient handoffs, and due to the nuances in the daily practice of each medical specialty, physicians and residency programs are left with the task of creating a handoff tool that fits the individual needs of the hospital and patient population they serve.<sup>7-9</sup>

Pathology and Laboratory Medicine residents and attending physicians do not routinely or consistently work from patient lists created in the electronic medical record, and because much

of the daily work is focused on overarching general laboratory function, handoff communication is often about instrumentation, assay downtime, blood product inventory, or anticipated specimen receipt and subsequent handling, to name a few examples. Thus, patient list- or electronic medical record-driven handoff tools previously described in the literature are not inclusive to the issues possibly encountered by an overnight on-call pathology resident.<sup>10-13</sup>

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Our primary goal was to develop a brief, structured handoff tool for pathology residents useful for both patient-specific communication and information about general laboratory operation. The secondary goal was to increase on-call resident confidence and comfort in handling overnight calls.

## Materials and Methods

The University of Vermont Medical Center (UVMMC) is a 500+ bed rural-based level I trauma center in Burlington, Vermont, that accessions over 40 000 surgical, 3500 cytology, and 300 bone marrow specimens, performs over 150 autopsies, and transfuses over 5000 units of red blood cells per year. There are a total of on average 16 residents in the combined anatomic pathology (AP) and clinical pathology (CP) residency program. There is one pathology resident on call per night and per weekend day who covers all calls for both AP and CP services. On-call duties are covered by postgraduate year (PGY) 2, 3, and 4 residents with attending pathologist oversight. Fellows and PGY 1 residents at UVMMC do not participate in the on-call schedule.

The pathology resident handoff tool was designed to consider: (1) location: due to the written nature of the handoff, the call taker only needs access to e-mail and telephone; (2) timing: excluding an extenuating circumstance (eg, frozen section, massive transfusion protocol activation), the handoff intervention should occur before the on-call resident assumes responsibility for the services; (3) format: an electronic template consisting of standard content; (4) education: a one-time workshop designed to teach residents how to provide handoff; (5) supervision: on-service faculty attending pathologists included on written handoff.

The acronym CATCH was used to help residents remember important information to be included in the communication tool: **C**linical summary, **A**ctive issues, **T**ests, **C**ontingency plan, and **H**ear it back (CATCH; Table 1). All residents received a one-time educational training session on how to use the CATCH tool prior to implementation. Residents on daily service were asked to write an e-mail with the word “CATCH” in the subject line and using the CATCH structure in the body of the e-mail to communicate active issues to the on-call resident at the end of the day, prior to the on-call resident assuming responsibility for the service. If the on-service resident had no active issues to report to the on-call resident, then a simple e-mail stating such was sent. The on-call resident was expected to read their CATCH e-mails and respond to the on-service resident that they received the message. The on-service resident could “hear it back” by either e-mail or voice conversation with the on-call resident to ensure clear communication. If the on-call resident deemed the call issue described in the CATCH e-mail as straightforward, then an e-mail response to the service resident was appropriate. However, a more complex patient issue required a verbal conversation between the on-call resident and the service resident. Attending pathologists were included on CATCH e-mails and therefore reviewed handoffs regularly to ensure adherence to each component of

**Table 1.** Pathology Resident CATCH Handoff Tool With Example.

Component	Expectation
Clinical summary	Short summary of the current clinical course
Active issues	Active patient issues in the context of the pathology service
Tests	Testing to be performed or pending tests relevant to pathology or clinical decision-making
Contingency plan	Plan for next steps given anticipated test results or change in clinical course
Hear it back	On-call resident receives CATCH e-mail and contacts on-service resident to repeat back or confirm receipt of the information to ensure understanding
Example	
Clinical summary	Smith (MRN 1234)—28-year-old female in labor, full-term, hemophilia A carrier
Active issues	Sex of fetus is unknown. Treatment plan for baby (if male) established in electronic medical record of mom—see Hematology note from 01 Oct 0000. Coagulation instrument #1 is out of service for maintenance. Instrument #2 currently running VWF activities and fibrinogen. Instrument #3 only calibrated for fibrinogen and PT/INR.
Tests	STAT factor 8 activity when male baby delivers
Contingency plan	If male baby delivers overnight, need to QC instrument #2 for factor 8 activity assay and move fibrinogen assay to instrument #3. Pediatric resident will page pathology if/when baby delivers.
Hear it back	On-call resident has conversation with on-service resident to confirm understanding

Abbreviations: VWF, Von Willebrand Factor; PT, Prothrombin Time; INR, International Normalized Ratio; STAT, immediate/urgent testing; QC, Quality Control.

the handoff program. Finally, the on-call resident was asked to use the original CATCH e-mail to notify the on-service resident and attending pathologist the following morning of any updates that occurred overnight or to make them aware of new issues from overnight.

A survey was designed to assess the residents’ perceptions of their knowledge and attitude toward the handoff process, their perceived ability to present and receive handoff information, and their comfort in performing typical on-call tasks (see Supplemental Appendix). The survey was administered to residents who were part of the on-call schedule prior to the CATCH tool implementation and again at 6 and 12 months postimplementation, for an overall study time period of 12 months between January 2017 and December 2017. The initial and follow-up surveys contained the same questions. The survey consisted of neutral 5-point Likert-scaled statements (1 = strongly agree/extremely helpful, 2 = agree/helpful, 3 = undecided/somewhat helpful, 4 = disagree/slightly helpful, 5 = strongly disagree/not at all helpful) to avoid leading questions.

**Table 2.** Pathology Resident Responses Before and After CATCH Tool Implementation.\*†

Survey Question	CATCH Tool Intervention			Resident Experience (Seniority)		
	Pre-CATCH Tool, Mean (SD)	Post-CATCH Tool, Mean (SD)	P (95% CI)	PGY 1 and 2, Mean (SD)	PGY 3 and 4, Mean (SD)	P (95% CI)
I know how to give handoff when I leave work at the end of the day	2.6 (1.3)	1.6 (0.8)	<.01 (0.3-1.7)	2.7 (1.1)	1.2 (0.6)	<.01 (0.9-2.1)
I know how to receive handoff when I arrive at work	2.4 (1.1)	1.8 (1.1)	NS	2.5 (1.0)	1.6 (1.1)	.01 (0.2-1.6)
I know how to make contingency plans	2.3 (1.1)	2.2 (1.2)	NS	2.9 (0.9)	1.4 (0.8)	<.01 (0.9-2.1)
I know how to perform a read-back	1.9 (1.1)	1.5 (0.8)	NS	2.1 (1.0)	1.2 (0.4)	<.01 (0.4-1.4)

Abbreviations: CI, confidence interval; SD, standard deviation; NS, not significant.

\*1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree, 5 = strongly disagree.

†P > .05.

All survey responses were anonymous. The unpaired, 2-tailed *t* test was used for continuous variables, with statistical significance defined as  $P \leq .05$ .

## Results

A total of 20 unique pathology residents provided survey responses during the study period. A total of 44 surveys were distributed over the 3 study time periods, with 39 surveys returned for a response rate of 89%. There was near universal strong agreement that “handoffs are important for patient safety” and that “handoff standardization is important” (1.0 and 1.3 out of 5, respectively).

Of residents surveyed prior to implementation of the CATCH tool, 6 (67%) out of 9 stated they had previously participated in a structured handoff during medical school training when assuming care of patients. Resident response to the statement, “Handoffs were well taught in the medical school I attended” was on average 2.8 out of 5 (standard deviation 1.3), which approached an “undecided” rating. Prior to routine use of the CATCH tool, resident perception of the average time to perform a handoff ranged from less than 5 minutes to greater than 30 minutes, with an average of less than 15 minutes. The mean perceived duration of the handoff sessions remained unchanged at both 6 and 12 months after implementation of the CATCH tool.

Pathology residents across all levels of training overwhelmingly found the CATCH tool “helpful” or “extremely helpful” in preparedness to assume care of complex patients, awareness of acute or active call issues, increasing resident confidence in taking call and managing call issues, and improving communication among pathology residents and providers (Tables 2 and 3). Among call takers (PGY 2, 3, and 4) and non-call takers (PGY 1), there was a statistically significant increase in resident ability to perform a handoff after the CATCH tool was implemented. However, it was not the CATCH tool but resident PGY that correlated with ability to receive information from a handoff, make contingency plans, perform a read-back, and successfully manage calls to attending pathologists/other clinicians.

Among call takers (PGY 2, 3, and 4), the CATCH tool implementation did not significantly increase comfort level with

selected on-call situations (Table 3). There was a statistically significant increase in comfort level in handling on-call situations in AP, frozen section, specimen processing, blood bank, and hematology that correlated with increasing level of training and experience. There was an overall trend toward increased comfort level in all call situations and perceived ability to use the CATCH tool with incremental improvement in each year of residency training and the most drastic difference between new call takers (PGY 2) and the most senior call takers (PGY 4).

## Discussion

The CATCH tool provided a structured, standardized handoff tool for residents to communicate important information between the on-service, day resident and the pathology resident assuming overnight call duties. Pathology residents universally found the CATCH tool helpful in their daily workflow yet the survey responses indicated it was the natural progression into senior years of residency (PGY 3 and 4) that increased resident comfort level with call issues, not the CATCH tool itself. Thus, experience had a bigger impact on resident confidence in their pathology practice compared to a single handoff tool to help with the immediate clinical and laboratory operations. However, a structured and anticipated communication tool seemed to anecdotally decrease anxiety about call situations and positively influenced and built good communication habits among pathology residents.

Contingency planning and ability to guide provider use of lab resources were skills that the residents universally found most difficult. These are not skills usually expected of junior residents, rather they are acquired through years of practice and experience with a variety of clinical and operational situations. Many senior residents and junior attending physicians may struggle with planning for the unexpected and guiding providers through the vast array of laboratory tests. However, by asking residents to make contingency planning a standard part of their handoff communication, the CATCH tool also functioned as an educational tool and a forum that facilitated resident and attending collaboration in developing strategies for better patient care and laboratory operations.

**Table 3.** On-Call Residents (PGY 2-4 Only) Experience Using the CATCH tool.\*,†

Survey Question	CATCH Tool Intervention			Resident Experience (Seniority)		
	Pre-CATCH Tool, Mean (SD)	Post-CATCH Tool, Mean (SD)	P (95% CI)	PGY 2, Mean (SD)	PGY 4, Mean (SD)	P (95% CI)
I feel comfortable calling an attending with a question	1.9 (1.1)	1.6 (0.8)	NS	2.1 (0.8)	1.0 (0)	<.01 (0.5-1.7)
I feel comfortable dealing with calls from other clinicians	2.0 (1.2)	1.9 (0.9)	NS	2.5 (0.8)	1.3 (0.5)	<.01 (0.6-1.8)
I feel comfortable taking anatomic pathology call	2.0 (0.9)	1.8 (0.7)	NS	2.7 (0.6)	1.6 (0.7)	<.01 (0.5-1.7)
I feel comfortable performing a frozen section on call	2.4 (0.9)	1.8 (0.8)	NS	3.0 (1.0)	1.7 (0.9)	<.01 (0.4-2.2)
I feel comfortable taking clinical pathology call	1.7 (0.5)	1.8 (0.4)	NS	2.0 (0)	1.7 (0.5)	NS
I feel comfortable dealing with calls from specimen processing on call	2.1 (0.9)	1.7 (0.5)	NS	3.0 (1.0)	1.6 (0.5)	<.01 (0.5-2.3)
I feel comfortable dealing with calls from chemistry on call	1.7 (0.5)	2.2 (0.9)	NS	2.0 (0)	2.0 (1.0)	NS
I feel comfortable dealing with calls from microbiology on call	1.7 (0.5)	1.7 (0.5)	NS	2.0 (0)	1.6 (0.5)	NS
I feel comfortable dealing with calls from the blood bank on call	1.8 (0.4)	1.5 (0.5)	NS	2.0 (0)	1.3 (0.5)	.04 (0.04-1.4)
I feel comfortable reviewing a Kleihauer-Betke smear on call	1.8 (0.7)	1.9 (0.6)	NS	2.3 (0.6)	1.7 (0.7)	NS
I feel comfortable reviewing a peripheral blood smear on call	1.7 (0.5)	1.5 (0.5)	NS	2.0 (0)	1.3 (0.5)	.04 (0.04-1.4)
I feel comfortable reviewing special coagulation on call	2.0 (0.7)	2.1 (0.6)	NS	2.3 (0.6)	1.8 (0.4)	NS
How helpful was a structured handoff with respect to the following:						
Preparedness to assume care of complex patients	1.5 (0.8)	1.3 (0.6)	NS	1.5 (0.7)	1.2 (0.7)	NS
Awareness of the acute or active issues pertaining to patients' care	1.5 (0.8)	1.4 (0.6)	NS	1.5 (0.7)	1.2 (0.7)	NS
Ability to guide providers' use of lab resources	1.7 (0.6)	2.4 (0.9)	0.01 (-1.3 to -0.1)	2.4 (0.8)	2.3 (1.1)	NS
Increasing resident confidence at taking call and managing call issues	1.6 (0.8)	1.5 (0.5)	NS	1.9 (0.7)	1.4 (0.5)	NS
Improving communication among pathology call resident and providers	1.6 (0.5)	1.6 (0.6)	NS	1.8 (0.4)	1.6 (0.7)	NS

Abbreviations: CI, confidence interval; NS, not significant; PGY, postgraduate year; SD, standard deviation.

\*1 = strongly agree/extremely helpful, 2 = agree/helpful, 3 = undecided/somewhat helpful, 4 = disagree/slightly helpful, 5 = strongly disagree/not at all helpful.  
†P > .05.

After the CATCH tool was implemented into daily practice, the residents reported a decreased ability to guide provider use of lab resources. Whether the contingency plan provided in the CATCH tool was too prescriptive for residents to follow when on call or whether this finding was a consequence of our small sample size requires additional studies.

The CATCH tool provided structured guidance while being flexible enough, in the form of an e-mail, to tailor the elements of the communication tool to the needs of the residents. Additional elements like platelet inventory or laboratory technologist/clinical team contact information, for example, were easily incorporated into the CATCH e-mail in real time. There was no perceived or reported discontent with the increased number of e-mails after using the CATCH tool. By asking residents to

send and anticipate receiving a CATCH e-mail every day, on days when the e-mail was delayed or accidentally forgotten, residents actively sought out the communication either by pager or in-person conversation, thus consistent communication became a habit for most residents. The CATCH e-mail was not as sophisticated as an on-call database, or call log system, which retrospectively collects data in a searchable format.<sup>12,13</sup> However, the CATCH e-mail provided a prospective, easily accessible, flexible, and secure communication tool for pathology residents and their attending pathologists.

A limitation of this study was that we could not assess the direct impact of the CATCH tool on patient safety. However, it is well known that effective communication is paramount to patient safety in the hospital.<sup>14</sup> The "hear it back" component

of the CATCH tool was designed to incorporate the “read-back” process of critical results between the laboratory and the clinical team, which was specifically implemented to decrease miscommunication and help improve patient safety. Thus, while we could not directly measure the impact of the CATCH tool on patient safety over our short period of analysis, the handoff structure facilitated effective communication in the laboratory and anecdotally improved, albeit indirectly, patient safety. Future studies that includes long-term follow-up of patient safety measures would be useful to examine the effect that pathology resident communication practices directly have on patient outcomes.

Anonymous survey responses were chosen because of our small program size and we wanted unbiased feedback from residents as they progressed through the training program using the CATCH tool. Thus, paired analysis could not be performed which would have captured individual resident feedback and helped determine the influence of PGY versus the CATCH tool intervention. We did not seek formal feedback from attending pathologists due to the small number of pathologists that lead “call-heavy” sections of the laboratory, which may bias the results. Anecdotally, attending pathologists appreciated the increased amount of active communication between residents on their service and on call.

In conclusion, a structured handoff tool for pathology residents provides consistent and timely communication between residents and attending physicians. Progression through the residency training program increased resident confidence with pathology on-call issues rather than implementation of a structured handoff tool. However, a structured handoff process increased pathology resident expectation of and awareness to the importance of clear and concise communication in support of a culture of increased patient safety.

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### Supplemental Material

Supplemental material for this article is available online.

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