

# I-CATCH: A Novel Bundle to Improve Postcall Morning Handoffs

Jonathan S. Zipursky, MD, FRCPC

Gousia Dhar, MBBS

Adina Weirnerman, MD, MHSc, FRCPC

Lynfa Stroud, MD, MEd, FRCPC

Brian M. Wong, MD, FRCPC

## ABSTRACT

**Background** Conducting postcall morning handoffs using a resident handoff bundle such as I-PASS can prove challenging. This may delay recognizing and acting on clinically important patient issues that arose overnight.

**Objective** We developed and implemented the I-CATCH morning handoff bundle and evaluated its impact on the proportion of overnight patient issues handed off from the on-call resident to the daytime team.

**Methods** We evaluated the I-CATCH (Identify patient; Characterize situation; Action—what was done overnight?; To do for the team in the morning; Confirm the Handoff) handoff bundle from November 2015 to May 2016 on general internal medicine wards at 1 academic teaching hospital. The bundle entailed staff/resident training, structured communication, and dedicated handoff space and time. We compared handoffs of overnight on-call issues by evening resident to daytime medical team before and after implementation, and used statistical process control to analyze adherence to the mnemonic.

**Results** We observed 435 handoffs (242 pre- and 193 postimplementation) over 63 days. There was no significant association between I-CATCH implementation and proportion of on-call overnight issues handed off (OR = 0.96; 95% confidence interval [CI] 0.52–1.47;  $P = .85$ ). Running the list by going through patients one-by-one (OR = 1.74; 95% CI 1.1–2.77;  $P = .019$ ), progress note documentation (OR = 3.80; 95% CI 2.19–6.60;  $P < .001$ ), and direct handoff (OR = 4.84; 95% CI 1.43–16.42;  $P = .011$ ) correlated with an increased likelihood of morning handoff.

**Conclusions** Implementing the I-CATCH bundle did not improve handoff of overnight issues to the daytime team.

## Introduction

Efforts to improve patient handoffs are critical for patient safety. Despite research demonstrating that patient handoff bundles such as I-PASS reduce medical errors and near misses,<sup>1,2</sup> efforts to replicate these interventions have been met with implementation challenges.<sup>3</sup> A systematic review of educational interventions to improve patient handoffs concluded that “inadequate reporting of interventions, especially as they relate to educational theory, pedagogy, curricula, and resource requirements, continues to impede replication.”<sup>4</sup>

A previous study at our institution showed that nearly 40% of on-call issues on general internal medicine wards were not handed off to the daytime team the next morning.<sup>5</sup> These omissions could lead to delays in recognizing and acting on clinically important information.<sup>6</sup> To address this challenge, we supplemented our existing I-PASS training with a focus on morning handoff, and developed and implemented a morning handoff bundle based on the mnemonic I-

CATCH (Identify patient; Characterize situation; Action—what was done overnight?; To do for the team in the morning; Confirm the Handoff). We sought to determine whether supplementing I-PASS with the I-CATCH bundle improved morning handoffs.

## Methods

We compared morning handoff practices before (November 2015 to February 2016) and after (March 2016 to May 2016) I-CATCH bundle implementation across 4 general internal medicine wards at Sunnybrook Health Sciences Centre, a large tertiary-care academic hospital affiliated with the University of Toronto. At baseline, general internal medicine residents and faculty on the inpatient service already received I-PASS evening handoff training, consisting of two 1-hour interactive sessions per month. We supplemented this with a monthly 1-hour session of dedicated I-CATCH training for residents and faculty on the inpatient service. Faculty provided direct observation and feedback on resident handoff skills intermittently during the I-CATCH intervention phase and subsequent I-CATCH training sessions.

We developed the I-CATCH handoff bundle by drawing on elements of the I-PASS handoff bundle,

DOI: <http://dx.doi.org/10.4300/JGME-D-18-00178.1>

*Editor's Note: The online version of this article contains descriptions of the I-CATCH bundle and plan-do-study-act cycles.*

TABLE 1

Resident and Morning Handoff Characteristics Pre- and Postimplementation of I-CATCH Intervention

Resident Characteristics	Study Phase		P Value
	Pre-I-CATCH (November 11, 2015 to March 4, 2016)	Post-I-CATCH (March 16, 2016 to May 20, 2016)	
Training level, n (%)			
PGY-1	31 (91)	28 (97)	NS
> PGY-1	3 (9)	1 (3)	
Training program, n (%)			
Internal medicine	25 (74)	15 (52)	NS
Other	9 (27)	14 (48)	
Resident rotation, n (%)			
Core GIM CTU resident	29 (85)	26 (90)	NS
Fly-in overnight resident	5 (15)	3 (10)	
<b>Morning Handoff Characteristics</b>			
Progress note documentation, n (%)	60 (25)	45 (23)	NS
No. of patients per team, mean (SD)	17.5 (3.8)	18.2 (2.7)	NS
No. of newly admitted patients, median (IQR)	2 (1-3)	2 (1-2)	NS
Time for morning handoff (min), mean (SD)	43.4 (16.0)	49.7 (16.6)	NS
Time for overnight issues (min), median (IQR)	5.5 (2-10)	4.0 (1.5-6.0)	NS
Running the list, n (%)			
Yes	21 (62)	13 (45)	NS
No	13 (38)	16 (55)	
Direct handoff (ie, no use of an intermediary to pass on information), n (%)			
Yes	34 (100)	26 (90)	NS
No	0 (0)	3 (10)	
Handoff location, n (%)			
Dedicated (closed) space	28 (82)	22 (76)	NS
Open area	6 (18)	7 (24)	
Distractions, median (IQR)	2 (0-4)	0 (0-2)	.014
Faculty present, n (%)			
Yes	31 (91)	28 (97)	NS
No	3 (9)	1 (3)	

Abbreviations: PGY, postgraduate year; NS, not significant; GIM, general internal medicine; CTU, clinical teaching unit; IQR, interquartile range.

Note: Chi-square tests were used to compare categorical variables. Fisher's exact test was used if expected cell sizes less than 5. Level of significance was set at  $P < .05$ .

such as dedicated space for handoffs,<sup>7</sup> and included successful elements from a prior study of morning handoffs (ie, "running the list" by going through patients one-by-one).<sup>5</sup> This bundle included: (1) monthly resident and staff physician training sessions; (2) structured communication using the I-CATCH mnemonic; and (3) dedicated time and space for handoffs. Two investigators (J.S.Z. and B.M.W.) developed and refined the I-CATCH bundle using rapid-cycle change methodology (see online supplemental material for descriptions of the I-CATCH bundle and plan-do-study-act cycles).<sup>8</sup>

### Data Collection

The main outcome measure was the proportion of overnight on-call issues handed off by the on-call resident to the daytime team. Secondary outcomes

evaluated the use of structured communication—defined by the proportion of handoffs that adhered to all 5 elements of I-CATCH.

We collected data using a similar methodology as in our prior study of morning handoffs.<sup>5</sup> We randomly selected 1 of the 4 internal medicine teaching teams for data collection each day, excluding the first week of the 4-week rotation to allow residents to receive I-CATCH training. Prior to morning rounds, a research assistant identified overnight issues by reviewing records for all patients covered by the overnight resident (excluding patients newly admitted overnight because these patients were discussed in greater detail as part of case review), and then directly observed morning handoffs to determine the proportion of those on-call issues verbally handed off to the daytime team.

**TABLE 2**  
Factors Associated With Proportion of On-Call Issues Handed Off to Daytime Team

Factor	Multivariable Analysis	
	OR (95% CI)	P Value
Omnibus likelihood ratio ( $\chi^2$ (df), <i>P</i> value)	...	< .001
Intervention ( <i>yes versus no</i> )	0.96 (0.59–1.54)	.85
Handoff process ( <i>running the list versus other</i> )	1.74 (1.10–2.77)	<b>.019</b>
Progress note in chart ( <i>yes versus no</i> )	3.80 (2.19–6.60)	< <b>.001</b>
Style of handoff ( <i>direct versus indirect</i> )	4.84 (1.43–16.42)	<b>.011</b>
Location ( <i>dedicated room versus open area</i> )	1.21 (0.66–2.18)	.55
Training level ( <i>PGY-1 versus &gt; PGY-1</i> )	1.06 (0.28–4.03)	.94
Training program ( <i>internal medicine versus other</i> )	0.74 (0.46–1.2)	.22
Team familiarity ( <i>team member versus “flyin”</i> )	1.38 (0.62–3.12)	.43
Distractions	0.96 (0.87–1.05)	.36
On-call case load	1.05 (0.86–1.31)	.60
Internal medicine team size	0.95 (0.89–1.01)	.12

Abbreviations: OR, odds ratio; PGY, postgraduate year.

Note: Level of significance was set at  $P < .05$ . Significant *P* values are shown in boldface type.

The research assistant also determined whether the resident used a structured communication approach and gathered data on other important handoff processes, such as systematically running the list, using a dedicated room, performing a direct handoff instead of using an intermediary, and number of distractions. We also collected demographic data for on-call resident physicians as well as measures reflecting on-call workload, including the number of new patients admitted overnight and the number of existing patients covered by the on-call resident.

The Sunnybrook Research Ethics Board approved this study.

### Statistical Analysis

We computed summary statistics and univariate analyses to compare handoff and resident characteristics before and after the I-CATCH intervention. We used a multivariable logistic regression analysis with a priori covariate selection to evaluate the association between the I-CATCH intervention and the completeness of morning verbal handoffs and to calculate the corresponding adjusted odds ratios (ORs) and 95% confidence intervals (CIs). We considered  $P < .05$  statistically significant.

Statistical analyses used SAS University Edition (SAS Institute Inc, Cary, NC), and QI Macros (KnowWare International Inc, Denver, CO) was used to generate statistical process control charts.

### Results

We observed morning handoffs for 34 days before and 29 days after I-CATCH implementation, with 242 overnight issues identified pre-I-CATCH (22

residents observed) and 193 overnight issues post-I-CATCH (21 residents observed). There were more handoff distractions in the pre-I-CATCH phase (median of 2 [IQR 0–4] versus 0 [IQR 0–2],  $P < .014$ ), but otherwise there were no differences in resident physician or morning handoff characteristics between the 2 phases (TABLE 1).

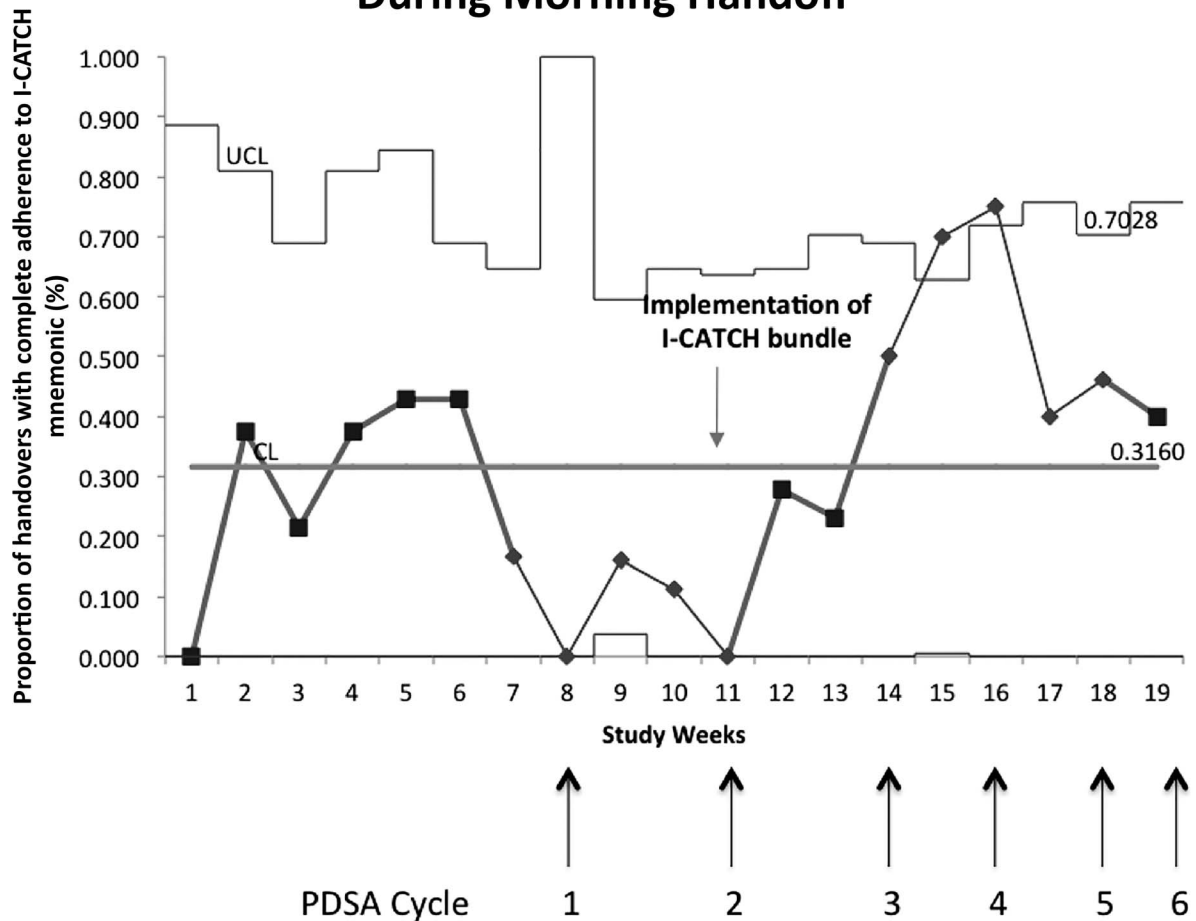
Overall, the on-call resident handed off 58% of overnight events to the daytime team. There was no association between I-CATCH implementation and issues handed off in the morning (OR = 0.96; 95% CI 0.52–1.47;  $P = .85$ ; TABLE 2). However, running the list (OR = 1.74; 95% CI 1.1–2.77;  $P = .019$ ), progress note documentation (OR = 3.80; 95% CI 2.19–6.60;  $P < .001$ ), and direct handoff (OR = 4.84; 95% CI 1.43–16.42;  $P = .011$ ) were associated with an increased likelihood of morning handoff of overnight events (TABLE 2).

Completeness of morning handoff (ie, adherence to all 5 elements of the I-CATCH mnemonic) was greater after implementation of the I-CATCH bundle (56% [61 of 109] versus 30% [43 of 145],  $P < .001$ ). The *P* chart (FIGURE) showed special cause variation (ie, nonrandom variation) immediately before and after implementation of the I-CATCH bundle, suggesting that the improvement is likely due to the intervention contrasting with secular trends.

### Discussion

We improved the use of a structured communication approach among residents handing off on-call issues in the morning, but the overall proportion of on-call issues handed off did not increase. Systematically running the list, ensuring direct handoff, and writing

## p-Chart: Adherence to I-CATCH Mnemonic During Morning Handoff



**FIGURE**

Statistical Process Control Chart for Morning Handoffs Adhering to Structured I-CATCH<sup>a</sup>

<sup>a</sup> Plan, do, study, act cycles to implement the I-CATCH bundle occurred between weeks 11 and 17.

Note: Diamonds on the graph represent special cause variation, whereas square points are common cause variation.

a progress note about the issue correlated with higher rates of morning handoff.

Our intervention may not have achieved its intended impact due to inconsistent application of all handoff elements. Resident and faculty adherence to I-CATCH bundle elements was variable (TABLE 1). Our use of rapid-cycle change methods afforded us the ability to further characterize implementation barriers. At times, teams felt that direct handoffs and systematically running the list did not fit naturally with team discussions in the morning, highlighting the difficulty we faced integrating morning handoff processes with existing workflow.

Based on resident feedback, we planned to modify our electronic health record to facilitate overnight documentation (eg, inclusion of a morning handoff feature with a summary list of overnight issues) to cue

on-call residents and remind them to hand off these issues.<sup>9,10</sup> Our information technology (IT) department was unable to prioritize these changes. Also, our sample was limited and the time for assessing the I-CATCH intervention was short—29 days over a span of 3 months. It is possible that better adherence to handoff elements and improved handoff of overnight events may require more time and better familiarity with I-CATCH.

This study adds to the growing literature that suggests patient handoff interventions, like other well-known patient safety interventions, such as the surgical safety checklist<sup>11</sup> and the central line bundle,<sup>12</sup> are difficult to replicate.<sup>3,4</sup> Morning handoff interventions also must attend to broader workflow changes to ensure direct handoff and increase adherence to key processes such as running the

patient list and ensuring consistent documentation of overnight issues. These may be targets for future interventions to improve handoff practices.

## Conclusion

Supplementing I-PASS training with the I-CATCH program improved resident use of a structured approach to communicate overnight issues at morning handoff, but did not increase the proportion of on-call issues that were handed off by residents.

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All authors are with Department of Medicine, University of Toronto, Toronto, Ontario, Canada. **Jonathan S. Zipursky, MD, FRCPC**, is Clinical Associate Physician, Division of General Internal Medicine and Clinical Pharmacology and Toxicology, Department of Medicine; **Gousia Dhar, MBBS**, is a Resident Physician, Department of Medicine; **Adina Weinerman, MD, MHSc, FRCPC**, is Assistant Professor and Staff Physician, Division of General Internal Medicine, Sunnybrook Health Sciences Centre; **Lynfa Stroud, MD, MEd, FRCPC**, is Associate Professor and Staff Physician, Division of General Internal Medicine, Sunnybrook Health Sciences Centre; and **Brian M. Wong, MD, FRCPC**, is Associate Professor and Staff Physician Division of General Internal Medicine, Sunnybrook Health Sciences Centre.

Funding: This study was supported by a grant from the Sunnybrook Health Sciences Centre Alternate Funding Plan Innovation Fund.

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

Corresponding author: Jonathan S. Zipursky, MD, FRCPC, Sunnybrook Health Sciences Centre, Room E240, 2075 Bayview Avenue, Toronto ON M4N 3M5 Canada, 647.920.0758, jonathan.zipursky@mail.utoronto.ca

Received February 28, 2018; revisions received July 2, 2018, and October 15, 2018; accepted October 15, 2018.