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# Sign-Out Snapshot: Evaluation Of Written Sign-Outs Among Specialties And Role Of Hospitalist Sign-Out

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Sign-out snapshot: evaluation of written sign-outs among specialties and role of  
hospitalist sign-out

A Thesis Submitted to the  
Yale University School of Medicine  
in Partial Fulfillment of the Requirements for the  
Degree of Doctor of Medicine

by

Amy Rachel Schoenfeld

2013

## SIGN-OUT SNAPSHOT: EVALUATION OF WRITTEN SIGN-OUTS AMONG SPECIALTIES AND ROLE OF HOSPITALIST SIGN-OUT.

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In our first study, we compared written sign-out practices across specialties. We hypothesized that most sign-outs would contain key content and be updated within 24 hours, independent of specialty. We evaluated all non-Intensive Care Unit written sign-outs from five specialties on January 18, 2012, at Yale-New Haven Hospital. Our final cohort included 457 sign-outs: 313 medicine, 64 general surgery, 36 pediatrics, 30 obstetrics, and 14 gynecology. Though nearly all sign-outs (96%) had been updated within 24 hours, they often lacked key information. Hospital course prevalence ranged from 57% (gynecology) to 100% (pediatrics) ( $p < 0.001$ ). Clinical condition ranged from 34% (surgery) to 72% (pediatrics) ( $p = 0.005$ ). Thus, structured templates alone do not guarantee inclusion of critical content, and specialties have varied sign-out practices.

In our second study, we surveyed medicine hospitalists in order to assess the role of sign-out. We hypothesized that sign-outs deemed “sufficient” by hospitalists would contain certain content and be updated. Fifteen hospitalists at Yale-New Haven Hospital participated in a survey about inquiries they received overnight. Our final study cohort included 124 inquiries regarding 96 patients, 69 of whom had sign-outs. Chi square analysis found that sufficient sign-outs most often had a composite score of four (denoting inclusion of key content and being updated), and had at least two total anticipatory guidance statements and/or tasks. Hospitalists often use supplemental sources to answer overnight inquiries, suggesting that most sign-outs do not provide sufficient information.

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## **CHAPTER ONE: Sign-outs across specialties**

### **Introduction**

Handoffs occur during a change in responsibility for a patient from one care provider or team to another.<sup>1</sup> Patient handoffs have become increasingly central to patient care given the growing trend of limiting resident work-hours. These duty restrictions have led to increased transfers of care for patients.<sup>2</sup> Clear and concise interactions between physicians during handoffs are important for ensuring patient safety, as poor communication often contributes to medical errors.<sup>3</sup> For example, patients cared for by cross-covering physicians may be at a higher risk of experiencing preventable adverse events than patients cared for by their primary team.<sup>4</sup> Thus, comprehensive communication about these patients may help reduce patient harms and help guide physicians' decisions on clinical management.

Sign-out is the process (either written, verbal, or both) by which information is transmitted about patients from one medical team to another.<sup>1</sup> Written sign-out documents play a central role in assuring patient safety during these handoffs. Written sign-outs are more durable than are oral sign-outs. In addition, because the written sign-out process is not as limited by space or time as is the oral sign-out process, written sign-outs can provide a more detailed record of both old and new information. Essentially written sign-outs serve as a memory aid during a care provider's shift. Interestingly, the quality of written sign-outs has been found to affect the quality of oral sign-outs.<sup>5</sup> Failure to communicate relevant information effectively during a sign-out can lead to mistakes or delays in medical decision-making that ultimately threaten patient safety.<sup>6</sup> Poor quality sign-outs have been associated with adverse events, near miss events, delayed treatment

and diagnosis, and inefficient use of time (including work done unnecessarily that detracts house staff from other duties).<sup>7</sup>

Despite the importance of sign-outs for patient care and safety, there appears to be much variation and little standardization of these sign-outs, even within a specialty at a single institution.<sup>8</sup> Horwitz et al. evaluated how internal medicine residents approach the sign-out process. The study identified that only 38% of written sign-outs among internal medicine residents contained information on the patient's current clinical condition (including "symptoms, vital signs, physical exam, laboratory/procedure results, or clinical stability"), and only 30% of written sign-outs included information from all three categories of current clinical condition, hospital course, and tasks to complete.<sup>5</sup> Another study found that only 50% of written sign-outs had been updated daily for patients with a length of stay of at least five days, while only 42% of written sign-outs provided anticipatory guidance (using "if/then" statements) for the overnight team.<sup>9</sup> Surveys of residents further highlight that sign-outs often do not prepare residents adequately to handle overnight events.<sup>10</sup> In addition, residents often attribute patient harms and "near miss" events to poor handoff communication.<sup>11,12</sup> Thus, there is tremendous variation in the way residents write sign-outs to guide their overnight covering peers, and residents themselves are aware that sign-outs often lack content and timeliness.

It is unclear how different specialties approach sign-outs. Though researchers have examined written sign-outs within some specialties,<sup>5,8-10,13,14</sup> we are not aware of any studies that have compared how sign-outs vary across different specialties simultaneously. Part of the ultimate goal of our research is to construct general guidelines for how to write sign-outs, for all specialties. Given this goal, it is important to

understand how different specialties approach the sign-out process and what types of content they tend to incorporate into the sign-out. Standardization of sign-out offers the opportunity to improve sign-out quality, strengthen communication between care providers, and ultimately reduce the potential for error.<sup>15</sup>

Several instruments for evaluating written sign-outs exist, but there does not seem to be a standardized method of evaluating written sign-outs across all specialties.<sup>5,9,13,16</sup> It would be most efficient for medical educators and hospital quality personnel to have a single tool for evaluating all written sign-outs in the hospital. Thus, another aim of our research is to contribute to the handoffs evaluation literature by demonstrating the use of a potential evaluation tool. Our evaluation tool contains criteria, based on these several existing tools in the literature as well as on clinical experience, that we deem applicable to written sign-outs in general.

## **Hypothesis**

The main objective of our study was to evaluate written sign-out practices across specialties by assessing content and format, as well as whether the sign-outs had been updated within 24 hours. Given that our institution has a standardized written sign-out template applied across the entire institution, we hypothesized that most sign-outs would have similar content elements and would be updated within 24 hours, independent of specialty. We also hoped to identify attributes associated with high-quality sign-outs. To examine these issues, we conducted a cross-sectional analysis of sign-outs from five inpatient specialties at our institution.

## **Methods**

### *Setting*

Yale-New Haven Hospital (YNHH) is a 966-bed academic medical center located in New Haven, Connecticut. At the time of our study, YNHH used an electronic medical record system called Sunrise Clinical Manager [Allscripts, Chicago, IL]. Sign-outs were embedded within this electronic medical record.<sup>17</sup>

### *Sign-out Process at YNHH*

We studied sign-outs from medicine, general surgery, pediatrics, obstetrics, and gynecology. We further subdivided medicine into “hospitalist” and “house staff,” as these teams function independently at YNHH; thus, the terms “hospitalist” and “house staff” will refer to teams within internal medicine in this thesis.

Sign-out processes at YNHH differ among specialties, but usually contain both verbal and written components. Hospitalists are the exception, as they do not conduct verbal sign-out. Hospitalist teams are comprised of attending physicians, physician’s assistants (PAs), and nurse practitioners (NPs/APRNs). Hospitalist teams differ from house staff teams in their sign-out process, most significantly in their lack of verbal sign-out due to their high volume of patients. Hospitalist sign-outs are expected to be written initially by the admitting attending. PAs or NPs/APRNs are expected to update the sign-outs each day. Hospitalists are discouraged from writing “nothing to do” if there are no overnight tasks.

Internal medicine house staff teams are comprised of attending physicians, residents, interns, and medical students. Residents are expected to write the sign-out initially, but interns or residents can update the sign-out. Verbal sign-out is expected to place between interns, with residents supervising.

On general surgery teams, interns and PAs generally write and update sign-outs. Sign-out usually occurs between an intern and a PA.

In pediatrics, interns are expected to write and update sign-outs, though senior residents can update them as well. Interns are expected to lead the verbal sign-out process and residents are expected to supervise. It is expected that sign-outs are updated daily.

For both obstetrics and gynecology, interns and residents are allowed to write and update sign-outs; attending physicians rarely write sign-outs. Residents are expected to present verbal sign-out for gynecology, while both interns and residents are expected to present verbal sign-out for obstetrics, supervised by attendings.

#### *Sign-out Note at YNHH*

The written sign-out note is embedded within the electronic medical record (EMR) and includes a common structured template for all specialties (see Figures 1-3). Some specialties added additional specialty-specific fields (see Table A).<sup>17</sup> Some fields (name, location, gender, age, medical record number, visit reason, allergies, weight, admission date, conservator status, care coordination issues, and likelihood of being discharged the following day) are automatically inserted from the EMR, while others (such as primary medical doctor, history, and “to do” list) are free text, requiring data entry. Pediatric sign-outs automatically also include diet, while surgery sign-outs automatically include Hgb, Hct, PT, PTT, Ca, ionized Ca, WBC, bilirubin, cyclosporin level, and tacrolimus level. A patient’s medications are optional to include when printing the sign-outs.

Any clinician with access to the EMR (including medical students, PAs, APRNs, house staff, fellows, and attending physicians) can review and/or modify sign-outs. Once

created, a sign-out note remains open for continued editing and revision until the patient is discharged. Consequently, each patient can have only one sign-out note per hospitalization from any given specialty. However, different specialties can each create separate sign-out notes for the same patient. In preparation for verbal sign-out, teams often print a sign-out “report” which includes all sign-out notes for their patients.

### *Study cohort*

One investigator (A.S.) obtained all non-Intensive Care Unit (ICU) written sign-outs from five inpatient services at Yale-New Haven Hospital on the evening of Wednesday, January 18, 2012. We chose the date specifically because we wanted an “average” date that would be most representative of sign-outs at our institution. This date was in the middle of the resident work year, the rotation block, and the week. We chose to study five inpatient specialties- internal medicine, general surgery, pediatrics, obstetrics, and gynecology- that we felt would best represent a diverse group of general medical services at the hospital.

We excluded all patients in ICUs within each specialty. We did, however, include patients in step-down units. We excluded ICU services because ICUs often have their own unique systems of sign-out which varies widely from non-ICU services. We also excluded well baby nursery patients because pediatric teams generally do not produce written sign-out notes for these patients.

### *Data collection*

We included in our study any sign-out note created by the same specialty as the service to which the patient was assigned. We did not count sign-out notes written by consulting specialties.

### *Outcome Measures*

We assessed sign-out based on content and format, and whether the sign-outs had been updated within the last 24 hours. We defined outcome measures based on existing evaluation tools in the literature, and expert opinion.<sup>5-7,9,13,16</sup>

For content, we collected data about: whether the primary medical doctor (PMD) was listed; diagnosis and/or presenting symptoms; general hospital course (defined as a description of any event occurring during this hospitalization prior to sign-out collection date, including medication changes, treatments, and operations); new events (defined as a description of any event occurring on the sign-out collection date, including medication changes, treatments, and operations); clinical condition (defined as either objective data such as vital signs, physical exam findings, laboratory or procedure results; a description of the patient's stability or trajectory [eg. "improved" or "resolved"]; or a description of the patient's symptoms); and description of current mental status.

We assessed whether the sign-out contained anticipatory guidance- statements predicting overnight events. We defined these statements as if/then statements or statements qualifying a PRN order. We also examined whether the sign-out contained tasks (assignments for the overnight team, including "nothing to do" as a task.) We evaluated the text of all anticipatory guidance statements and overnight tasks to calculate frequencies of containing a plan for the predicted event or task, a rationale for that plan, both a plan and rationale, or neither.<sup>7</sup>

To examine format, we described the major variants of sign-out layout (ie. whether the sign-out contained only prose; whether it listed events by issue; or whether it

listed by either date or a combination of issue and date). We also collected data on the date when the sign-out had last been updated.

We created a composite score based on four elements that we felt defined a comprehensive sign-out: updated in the last 24 hours, included diagnosis/presenting symptom, included general hospital course, and included clinical condition. Sign-outs received one point for each of the four elements that they contained. We considered a sign-out with a composite score of four to be a high-quality sign-out.

#### *Variables associated with high quality sign-outs*

We looked at several variables to see if they were associated with quality of sign-out: specialty; training of the last person who updated the sign-out (such as medical student, APRN, resident, or attending), which we used as a proxy for who generally updated/wrote the sign-outs; and days since admission.

The Human Investigation Committee at Yale Medical School approved this study and granted waivers for the Health Insurance Portability and Accountability Act and for patient consent.

#### *Analysis*

We assessed the frequency of content elements, format, and being updated within 24 hours, and tested differences among specialties with chi-square or Fisher's exact tests as appropriate. Using a logistic regression model, we analyzed whether a composite score of four was associated with specialty, level of training of last updater, and days since admission. We used SAS 9.2 (SAS Institute, Cary, NC) for quantitative analyses. We used  $p < 0.05$  as the level of significance. All tests were two-tailed. Statistical analysis was performed by M.S.

## Results

### *Enrolled cohort*

Demographic information can be found in Table B. On the study date there were 654 patients admitted to eligible specialties: 392 medicine, 88 general surgery (including trauma, surgical oncology, transplant, endocrine, vascular, emergency general surgery, and gastrointestinal), 119 pediatrics, 42 obstetrics, and 13 gynecology. After excluding all ICU patients and well baby nursery patients, and re-categorizing patients who had been labeled with the wrong specialty, there were 489 eligible patients: 330 medicine (comprised of 165 hospitalist patients and 165 house staff patients), 68 general surgery, 36 pediatrics, 41 obstetrics, and 14 gynecology. Of these patients, 457 had sign-out notes: 165 medicine hospitalist (100% of eligible patients), 148 medicine house staff (90%), 64 general surgery (94%), 36 pediatrics (100%), 30 obstetrics (73%), and 14 gynecology (100%). Median days since admission for patients varied slightly across specialties, ranging from 1 day for both obstetrics and gynecology to 5 days for medicine house staff.

### *Sign-outs for patients admitted more than 24 hours*

Our study included 280 patients admitted more than 24 hours prior to data collection: 106 hospitalist, 100 house staff, 33 surgery, 22 pediatrics, 14 obstetrics, and 5 gynecology. Of these patients, 279 (99%) had sign-outs: 106 hospitalist, 100 house staff, 32 surgery, 22 pediatrics, 14 obstetrics, and 5 gynecology (Table B.)

### *Content*

The frequencies of content elements in sign-outs are shown in Table C. All p-values were significant for differences between specialties. Overall, we found several differences between specialties, but much consistency within specialties. Though 76% of

medicine hospitalist sign-outs and 70% of medicine house staff sign-outs included the patient's outpatient primary medical doctor, the other specialties rarely included primary medical doctor in their sign-outs (gynecology contained the least with 0%,  $p < 0.001$ , although gynecologists often serve as a PMD for their patients.) Only 81% of pediatric sign-outs contained information on diagnosis or presenting symptoms, compared to 96% or more in the other specialties ( $p < 0.001$ ). The prevalence of general hospital course in the sign-outs ranged from 57% (gynecology) to 100% (pediatrics) ( $p < 0.001$ ). Clinical condition was one of the less frequently described variables in sign-outs, ranging from 34% (surgery) to 72% (pediatrics) ( $p = 0.005$ ). Current mental status was the least included element across all sign-outs, ranging from 0% for both obstetrics and gynecology to only 7% for house staff ( $p < 0.001$ .) For inclusion of new events in sign-outs, specialties ranged from 48% (medicine hospitalist) to 73% (surgery) ( $p < 0.001$ ).

Neither anticipatory guidance statements nor overnight tasks were included in the majority of sign-outs across all specialties. The range of including anticipatory guidance statements was 0% (gynecology) to 39% (medicine house staff) ( $p < 0.001$ ). The inclusion of overnight tasks ranged from 0% (obstetrics) to 60% (medicine house staff) ( $p < 0.001$ ). In medicine overall (including hospitalist and house staff), which comprised the greatest absolute numbers of all anticipatory guidance statements and tasks, less than half of both types of statements contained both a plan and rationale (45% and 34%, respectively). However, only 4% of medicine anticipatory guidance statements and 8% of medicine tasks contained neither a plan nor rationale (Figure 4).

We identified several themes for anticipatory guidance statements. Most anticipatory guidance statements discussed one of the following: what to do if the patient

spiked a fever (usually to culture the patient and broaden antibiotics); medication recommendations for insomnia, agitation, or pain; plan for responding to a change in vital signs (usually hypoxia, tachycardia, or blood pressure fluctuations); parameters for avoiding nephrotoxic medications in patients with acute kidney injury; and transfusion parameters.

Tasks tended to focus on following up recommendations from consult teams; following up lab results; monitoring for worsening respiratory status and for appropriate overnight fluid intake and output; and ensuring the patient had the appropriate overnight procedure or imaging study. “Nothing to do” was often listed as a task.

#### *Format*

Training of last updater was used as a proxy to represent the person who most often contributes to the sign-out in each specialty (Figure 5). In medicine hospitalist and surgery, APRNs and PAs composed at least 50% of the sign-out updaters, while in the other specialties these practitioners contributed less, if at all, to sign-out updating. For medicine hospitalist patients we expected this number to be high, as there are no residents on hospitalist teams. In pediatrics, medical students and interns had updated most of the sign-outs (83%), while PGY2+ residents, fellows, and/or attending physicians had updated most of the obstetrics and gynecology sign-outs (73% and 86%, respectively).

Format varied among specialties (Figure 6). Pediatrics and obstetrics both tended to format their sign-outs by issue (89% and 97%, respectively). Surgery was divided between prose only (50%) and other (date or issue/date combination) (47%). Medicine hospitalists used predominantly prose format (96%), while medicine house staff were

more evenly divided among the three format groups. Gynecology contained mostly prose formats (79%).

#### *Updated*

Nearly all sign-outs across specialties (96%) had been updated within 24 hours (Table C.) All specialties excluding gynecology had greater than 92% of their sign-outs updated in 24 hours; gynecology had only 71% updated within 24 hours ( $p < 0.001$ ).

#### *Composite score analysis*

While the majority of sign-outs across all specialties (90%) had at least three elements of our composite score, less than half (49%) of all sign-outs contained all four elements. In addition, 0% of all sign-outs contained zero elements. Surgery had the lowest percentage of sign-outs with a composite score of four; thus it was used as the reference specialty for the multivariate analysis (Table E.) Compared to surgery, all specialties (with the exception of gynecology) were significantly more likely to have a composite score of four. We used PGY2+ residents, fellows, and attendings as a reference when examining the association of last updater training with composite score. We found that students and PGY1 trainees were significantly more likely than either other group (RNs, APRNs, and PAs, and PGY2+ trainees, fellows, and attendings) to have a composite score of four. We found that days since admission was not associated with a composite score of four.

### **Discussion**

In this cross-sectional study comparing sign-out practices across specialties, we found that specialties varied widely in their sign-out practices and that written sign-outs often lacked important information. YNH uses a standardized sign-out template across

all specialties. Thus, we would have predicted that at this institution there would be greater resemblance among sign-outs (in content elements, format, and being updated) than at institutions that use multiple templates across specialties. Yet despite using the same electronic sign-out tool, specialties varied widely in their sign-out practices. Thus, we found that structured templates alone do not guarantee inclusion of critical content.

Our results demonstrated that there were certain differences among specialties, but often trends within specialties. These findings suggest that specialties are consistent with their handoff education and/or that there are specialty-specific cultures regarding written sign-outs. Yet we further found that even within a single specialty, practices were distinct in different settings. For instance, obstetrics and gynecology are considered separate services but include the same overall resident pool. However, there are very different practices between obstetrics and gynecology regarding update frequency (97% versus 71%, respectively), which has a trickle down effect on variables such as hospital course and new events. Medicine provides another example; hospitalists and house staff varied on several elements such as format, anticipatory guidance, and tasks. The medicine hospitalist and house staff teams function independently at YNHH and seem to have slightly different approaches to the written sign-out. These differences may be influenced in part by the fact that hospitalists do not do verbal sign-out, and also by the distinct trainings experienced by house staff and PAs/APRNs (whom we found to be the main group updating hospitalist sign-outs).

We found that written sign-outs often lacked important information about patients. Studies have shown that poor quality sign-outs are associated with many negative outcomes, including adverse events, delayed treatment, and delayed diagnosis.<sup>7</sup>

In our study, clinical condition and new events each were present in less than two-thirds of all sign-outs. These variables are important to include, as they help create a full picture of the patient for the covering team. Current mental status was rarely described in sign-outs across all specialties. In addition, anticipatory guidance statements and overnight tasks (which we would not necessarily expect to reach 100% inclusion, as some patients do not need these) were rarely included within sign-outs across all specialties. The results for tasks may have been affected by the fact that we included “nothing to do,” as some specialties may not emphasize writing “nothing to do” as a task. One very reassuring finding from our study was that most sign-outs across all specialties had been updated within 24 hours.

Our results for medicine house staff were fairly comparable to those found in similar studies. Horwitz et al. analyzed the sign-out process for medicine house staff, prior to the implementation of a standardized sign-out template and prior to a sign-out curriculum that is now taught to medicine interns when they begin residency.<sup>18</sup> They found that 81% of written sign-outs included hospital course (which they defined as any event occurring during hospitalization, including new events); 39% of sign-outs included clinical condition (defined as in our study); and 99% of written sign-outs mentioned whether there were tasks to complete.<sup>5</sup> In our study, we found that 92% of medicine house staff sign-outs included hospital course; 70% of the sign-outs included new events; 59% included clinical condition; and 60% mentioned tasks (including “nothing to do.”) Clinical condition is now mentioned more frequently, but tasks are mentioned less frequently; perhaps it is not as common now to include “nothing to do” as a task. Bump et al. studied the sign-out process for medicine interns and found that 99% of written

sign-outs included general hospital course (similar to our findings); 42% of sign-outs included anticipatory guidance (if/then statements); and 90% included tasks.<sup>9</sup> Our study found 39% of medicine house staff sign-outs included anticipatory guidance. Thus, the biggest difference between the two studies was that we found a lower frequency of tasks in medicine house staff written sign-outs. These comparisons might suggest that medicine house staff training may need to focus more on including tasks in written sign-outs, or at least making it clear when there are no tasks to do.

This study has several limitations. First, as a single-site study at an academic institution it may not be widely generalizable. Our study is cross-sectional, relying on data from only one point in time, and may have been influenced by individual practitioners, especially within the smaller fields such as obstetrics and gynecology. Our study focused on written sign-out only, and did not include information provided during verbal sign-out. Thus, some of the components missing in the written sign-outs may have been discussed in person while teams were signing out to each other. Nonetheless, we believe written sign-outs should still contain at the very least the basic elements contained in our composite score, because verbal information is not durable. There are no official standards for how to write a sign-out; however, our assessments were based on numerous reports in the literature and have high face validity. Finally, we did not assess outcomes associated with quality of sign-outs, or accuracy of anticipatory guidance and tasks, and therefore face challenges in drawing conclusions about ideal content or format.

In conclusion, we conducted a cross-sectional study at an institution with uniform, standardized, EMR-based written sign-outs and determined that specialties differed in their approach to the written sign-out even in the presence of standardized templates. We

found that there were certain specialty-specific sign-out practices, and that specialties even varied in different settings. Most sign-outs across all specialties were updated within 24 hours, and most included more basic information such as diagnosis, hospital course, and new events. Sign-outs less frequently included more complex data such as clinical condition, anticipatory guidance, and overnight tasks, despite prompts included within the template. Given these findings, we support institutional standardization of the sign-out template but acknowledge that structured flexibility is also necessary. Standardized templates alone do not ensure inclusion of key content; key information that is missed continually in sign-outs needs to be emphasized in clinician training. We recommend teaching residents and hospitalists across specialties how to write sign-outs in a way that highlights basic sign-out principles, but that also addresses specialty-specific needs and cultures. We also suggest assessing the effect of these interventions on quality of sign-outs and on patient outcomes. Future research may focus on comparing sign-outs over time to understand whether there is improvement as more experience is gained. Our overall goal through these interventions and future research is to improve patient safety.

## **CHAPTER TWO: Hospitalist study**

### **Introduction**

As discussed in the previous chapter, handoffs are critical in ensuring patient safety, especially in today's era of increased transitions of care. Hospitalists play a substantial role in our current health care system. There are approximately 10,000-12,000 hospitalists in practice today, which is likely to increase to 30,000 within the next 10 years.<sup>19</sup> The Society of Hospital Medicine recognizes patient handoffs and sign-outs as a "core competency" for hospitalists.<sup>20</sup> Nonetheless, there is little literature evaluating the quality of hospitalist sign-outs. A review of controlled studies of hospital handoff interventions from 1975 to 2007 by the Society of Hospital Medicine's Handoff Task Force found no articles on hospitalist handoffs.<sup>21</sup>

Though hospitalists are attending physicians, rather than trainees, they also may benefit from a more standardized approach to sign-out practices, especially given the quantity of patients on hospitalist services and the constant transitions of care between members of the team. Early work suggests that hospitalists, like non-hospitalist clinicians, also have difficulties in providing efficient and effective handoffs.<sup>22</sup> In a recent survey, 13% of hospitalists reported they had received an "incomplete" sign-out (responding to the survey question "how complete was the exchange of information between you and the preceding physician?"); hospitalists who reported incomplete sign-outs also reported significantly more near miss and adverse events and reported spending more time dealing with questions about information that the sign-outs lacked.<sup>23</sup>

Yet it is unclear what defines an "incomplete" sign-out for hospitalists, or even whether hospitalists utilize sign-outs at all. Hospitalists are attending physicians who

have finished residency and often have many years of experience, so perhaps the sign-out is of less use to them. Thus, this study aimed to elucidate the conditions in which sign-outs are useful for hospitalists, in order to provide an evidence-based method to improve hospitalist sign-out skills and guidelines, and ultimately increase patient safety.

### **Hypothesis**

The main objective of this study was to assess the utility of sign-outs for medicine hospitalists by asking hospitalists to record each inquiry they received overnight and the source(s) of information they used to answer it. Because the hospitalist service at YNHH uses only written sign-outs, we did not have the possible confounder of having a verbal sign-out. Thus our study results reflect a pure indication of the value of the written hospitalist sign-out in answering overnight inquiries. By analyzing the circumstances in which hospitalists use sign-out overnight, and the circumstances in which they find sign-out inadequate, we can generate evidence about how hospitalists utilize sign-outs and what type of information is most useful.

We hypothesized that when hospitalists marked that the sign-out alone was sufficient in answering inquiries, the corresponding sign-outs would achieve higher composite scores. We also hypothesized that the “sufficient” sign-outs would contain a higher number of combined anticipatory guidance statements and tasks.

### **Methods**

#### *Setting*

This study took place at Yale-New Haven Hospital (YNHH), a 966-bed academic medical center located in New Haven, Connecticut. YNHH uses an electronic medical record system called Sunrise Clinical Manager [Allscripts, Chicago, IL]. Daytime

hospitalists work from 8:30 am to 4:30 pm most days; most also cover two longer shifts per week from 7:00 am to 5:30 pm. There are two “swing shift” hospitalists; one works from noon to 11 pm, and the other works from 9 am to 8 pm. These swing shift hospitalists bridge the transition between day hospitalists and night hospitalists (who arrive at 6 pm and work until 7 am.) On weekdays, full-time hospitalists generally carry anywhere from 10 to 19 patients and will admit zero to three new patients per day. On weekends, full-time hospitalists may carry even more patients. There are generally seven to eight overnight hospitalists working per night, though there are occasional moonlighting physicians as well. There is also a small group of part-time hospitalists who work from 8:30 am to 1:30 pm and carry roughly half the number of patients as full-time hospitalists.

The hospitalist service primarily cares for general medicine patients, though they also cover patients from subspecialty services when necessary. In general, there is continuity of care for patients cared for by the hospitalist service during days, though occasionally patients are redistributed during their admission. Preserving continuity during night shifts is not formally done.

#### *Study cohort*

All overnight hospitalist attending physicians (“hospitalists”) covering medical floors (excluding ICU, step-down, cardiology, and oncology services) were eligible for inclusion. Moonlighting physicians (both residents and fellows) were excluded. Each hospitalist was allowed to participate only once.

In addition, all daytime PAs and APRNs/NPs on medicine units were eligible to participate in a survey about sign-out training.

*Data collection*

Study investigators (A.S. and R.F.) enrolled hospitalists during one night per week for six weeks. We had one date of data collection on a weekend (Sunday night), but otherwise collected our data during weekday evenings. Each hospitalist signed informed consent prior to participating. Hospitalists were entered into a raffle ticket for a gift certificate. The surveys were designed to minimize time burden on the hospitalists.

Two investigators (A.S. and R.F.) printed sign-outs for all patients on the hospitalist service on each day of data collection at approximately 6 pm in order to evaluate the quality of the written sign-outs. One investigator (A.S.) coded the sign-outs. Coding was done using the same measures as were used in our prior specialty sign-out study. These measures included content elements, format, and whether the sign-out had been updated within the last 24 hours. We also used the composite score that we used in our prior study, which rewarded one point for each of the following four elements: general hospital course (a description of any event occurring during hospitalization but prior to date of data collection), diagnosis or presenting symptoms, current clinical condition (a description of either objective data, symptoms, or stability/trajectory), and updated within 24 hours. Having a composite score of four represented a high-quality sign-out.

Two investigators (A.S. and R.F.) distributed surveys to midlevel hospitalist practitioners (PAs and APRNs/NPs) about whether they had received training in how to write a sign-out, as these clinicians generally update the hospitalist service's sign-outs most frequently.

*Main Measures*

Each study night, hospitalists were asked to fill out a survey about overnight inquiries. We based our tool on the survey used by two of our investigators (L.H. and R.F.) in a prior study<sup>24</sup> (Figure 7). For each inquiry, hospitalists recorded details about who had called them, what the question was, whether the question was clinically important, whether the sign-out alone was sufficient (or not necessary) for answering the question, and whether they used additional resources (such as physician notes, orders, lab results, nurses, the patient, or reference materials.) Hospitalists were also asked about whether the primary team had and/or could have predicted the inquiry, whether the hospitalist physically saw the patient, and how much time the hospitalist spent addressing the question overall. If there were multiple inquiries about the same patient, hospitalists were instructed to count each inquiry separately.

We reorganized several measures once we received the survey responses. When hospitalists had marked “ancillary service” for who had asked, we divided the responses into “respiratory” (the majority of responses within that category) and “other.” If a hospitalist selected both “somewhat” and “not at all” for whether the inquiry was “clinically important”, the answer was counted as missing. When a hospitalist marked both “nurse” and “patient” for who had asked the inquiry, it was counted as the patient. If the hospitalist had marked both “not necessary” and “no” for whether the sign-out alone was sufficient to answer the inquiry, it was counted as not necessary.

Midlevel practitioners were asked how many years they had been in practice (in total, and at YNHH alone), whether they had been taught how to write a sign-out while in training, the style of the education (eg. lecture, workshop, in-person feedback session, or informal teaching), whether they had been taught how to write a sign-out at YNHH, and

the style of the education at YNNH. They were allowed to check more than one response for education type within both categories.

The Human Investigation Committee at Yale Medical School approved this study and granted waivers for the Health Insurance Portability and Accountability Act and for patient consent.

### *Analysis*

We used SAS 9.2 (SAS Institute, Cary, NC) for descriptive and comparative analyses. One investigator (M.S.) conducted all analyses. We first described categorical outcomes by calculating frequencies. We then assessed whether there was an association between a sign-out deemed “sufficient” to answer an inquiry and the following predictors: question topic (order reconciliation, clinical change, medication, and plan of care); composite score (scores of either 2, 3, or 4) of the written sign-out for that patient; days since admission; how clinically important the question was (either not at all, somewhat, or very); and sum of total anticipatory guidance statements and total tasks (0, 1, or at least 2) in the written sign-out for that patient. We first assessed the association of each predictor with the outcome of “sufficient” sign-out in chi square analyses and then constructed a single multivariate logistic regression model including all predictors.

## **Results**

### *Enrolled cohort*

Nineteen hospitalists were eligible to participate during the study period and all consented to enrollment; 15 (79%) returned their surveys. Hospitalists recorded a total of 124 inquiries about patients (mean of 8 inquiries per hospitalist, SD 2.7). We did not obtain written sign-outs for 20 patients (about whom there were 27 inquiries). Two of

these patients lacked sign-outs because their medical record numbers were erroneously recorded, while the rest either did not have sign-out notes or had not yet been assigned to the hospitalist service. Our final study cohort included 124 inquiries regarding 96 patients, 69 of whom (72%) had sign-outs.

Out of 38 eligible PAs and APRNs/NPs, 22 participated in our study; 21 were PAs and one was an APRN/NP.

The Hosmer and Lemeshow goodness of fit test showed that the chi square and multivariate models both fit our data (chi square p-value > 0.05).

#### *Descriptive Results: Inquiries*

Out of the total 124 inquiries, the vast majority originated from nurses (82%), followed next by patients (10%), consultants (5%), and respiratory therapists (2%) (Table F). After assessing the types of inquiries being made, we grouped the inquiries into several general categories: order reconciliation (eg. for oxygen requirement or for telemetry); clinical change (eg. vital signs, symptoms, or labs, but excluding medications); medication; and plan of care (eg. discharge information, goals of care [GOC], IV line placement, continuous positive airway pressure [CPAP] use, or upcoming procedure in the next 24 hours). Medication inquiries that included references to vital sign or symptom changes were included within the medication category. We found that, after excluding two missing responses, almost half (45%) of the remaining inquiries were medication-related. The next most popular types of non-medication inquiries were related to either plan of care (21%) or clinical changes (21%), followed by order reconciliation (12%). Half (50%) of the inquiries (excluding one missing response) were considered

“somewhat” clinically important, while 27% of the inquiries were “very” clinically important and 23% were “not at all” clinically important.

For 26% of the total inquiries (excluding three missing responses), hospitalists did not consider the sign-out necessary for answering the inquiry. Hospitalists used the sign-out 74% of the time (excluding missing responses and “not necessary” responses.) Those who used the sign-out considered it sufficient alone to answer the inquiry only 30% of the time. Hospitalists were asked which references they used when the sign-out was not sufficient; they were allowed to choose more than one reference. We found that physician notes were the most frequently utilized as an additional reference, followed by nurses, labs/studies, orders, patients, and other, respectively.

The primary team did not predict most of the inquiries (86%, excluding five missing responses); 14% had been predicted. Of the inquiries that were not predicted, hospitalists felt that 46% could have been predicted. In total, the primary team predicted 27% of all predictable events. The hospitalist did not physically see the patient to answer 88% of inquiries (excluding seven missing responses).

*Descriptive Results: PA/NP survey*

Respondents to the PA/NP survey had a mean of six total years as a hospitalist (SD 6) and four years practicing at YNHH (SD 3.) Most (91%) had not received training in how to write a sign-out prior to coming to YNHH (Table G.) Of those who did receive training at another institution, the types of training were fairly even divided among lecture, in-person feedback, and teaching from other practitioners. The majority (95%) of respondents had received training at YNHH on how to write a sign-out. Over half (55%) had a lecture at Yale on how to write sign-outs, 50% had received in-person feedback,

and 77% had informal teaching from other practitioners. Only 5% had participated in a workshop.

### *Comparative Results*

Our chi square analyses are shown in Table H. We found that sign-outs were sufficient to answer the majority (71%) of order reconciliation-related inquiries, but less than a third in each of the remaining categories (29% of clinical change inquiries, 28% of medication-related inquiries, and 24% of plan of care inquiries,  $p=0.001$ .) We found that sign-outs were sufficient to answer 29% of inquiries associated with sign-outs with a composite score of four, compared to 16% of inquiries associated with sign-outs with a composite score of three and no inquiries associated with sign-outs with a composite score of two ( $p=0.05$ .) Sign-outs were sufficient more often for inquiries about patients admitted less than two days prior to data collection (40%) compared to patients admitted more than two days prior (16%,  $p=0.015$ .)

There was no significant difference in the rate of sufficient sign-out according to clinical importance of the inquiry (50% sufficient for not at all important, 19% for somewhat important, and 33% for very important.) Sign-outs were sufficient for the majority (60%) of inquiries associated with sign-outs containing at least two anticipatory guidance statements and/or tasks, compared to 14% for one statement and/or task and 34% with no statement or task.

In our multivariate analysis, no predictor was associated significantly with sufficient sign-out (Table I.)

### **Discussion**

We surveyed overnight hospitalist physicians about the types of inquiries they received during their shifts, as well as the utility of the sign-out in responding to those inquiries. For almost three-quarters of the inquiries (74%), the sign-out was considered a necessary tool in responding to the inquiry. This finding is critical because it implies that even hospitalists, who are experienced physicians, depend on sign-outs to answer overnight inquiries. Therefore, improving the quality of hospitalist sign-outs may affect patient care. We also found that for inquiries in which sign-outs presumably were utilized, only 30% were considered sufficient alone; the rest had to be supplemented by additional resources such as physician notes, lab/studies, and nursing information. Though hospitalists clearly rely on sign-outs, these sign-outs are not providing the types of information that the hospitalists need. Further, we found that sufficient sign-outs more often had a composite score of four and had at least two anticipatory guidance statements and/or tasks, suggesting that higher-quality sign-outs are more effective overnight.

For inquiries that are not as complex or do not require a thorough investigation of the patient's history, the sign-out may not play a vital role in responding to the inquiry. Yet our study suggests that hospitalists relied on the sign-out for the majority of inquiries. Despite the importance of the sign-out, we still found that these sign-outs were effective less than one-third of the time as the only resource. This sign-out insufficiency likely stems from infrequent focus on predicting inquiries. We found that the primary team had anticipated predictable inquiries only 27% of the time. Thus, it is important to consider restructuring how the hospitalist service approaches the sign-out process at our institution, and perhaps at other institutions. This process must encourage hospitalist clinicians (physicians, APRNs, and PAs) to focus on predicting overnight inquiries in

their sign-outs to prepare the overnight team for potential events. Prior literature suggests that inadequate sign-outs for hospitalists are associated with near miss events and adverse events, as well as with inefficiency.<sup>23</sup> Therefore, it is critical for patient safety to ensure that the sign-outs are comprehensive enough to address the most pressing and frequent inquiries that arise overnight. From our survey of PA and NP hospitalists, we found that most written sign-out education takes place informally with peers; formal education through lectures and workshops contributed less than two-thirds of the time. It may be important to build into the curriculum more formal opportunities for teaching sign-out so that practitioners can adopt a uniform approach.

We found that most inquiries came from nurses and that almost half were medication-related. Other major inquiry subtypes included plan of care, clinical changes, and order reconciliation. Though order reconciliation made up only 12% of the inquiries in our study, they were the question subgroup most likely to be associated with a sufficient sign-out. Hospitalists thus may be focusing their sign-outs on issues that are not the most applicable when responding to the actual types of inquiries they receiving. Hospitalists rated over three-quarters (77%) of overnight inquiries to be either somewhat clinically important or very clinically important. Answering these inquiries efficiently and accurately thus has major clinical import.

In this study, we tried to identify which variables are associated with sufficient sign-outs for hospitalists. Possibly due to our small sample size, multivariate analysis did not reveal any significant associations. In our chi square analyses we found that sign-outs were sufficient more often for inquiries in which the patient had been hospitalized for

fewer days. Thus, perhaps sign-outs are more sufficient for patients hospitalized for fewer days because inquiries become more complex and less predictable over time.

Other findings from the chi square analyses suggest that order reconciliation is the most likely subtype of question category to be associated with sufficient sign-outs. This suggests that hospitalists may need to focus more on addressing the other patient care issues that frequently came up in our survey, namely medications, clinical changes, and plan of care. Inquiries viewed as not at all clinically important were more likely to have a sufficient sign-out than inquiries considered somewhat clinically important. It is unclear if this suggests that hospitalist sign-outs lack information that is pertinent to the more clinically challenging inquiries, or whether clinically challenging inquiries compel hospitalists to investigate more thoroughly and thus use more resources to answer them, independent of sign-out quality.

Finally, sign-outs with at least two combined anticipatory guidance statements and tasks were the anticipatory guidance/task group most likely to be considered sufficient alone. This finding makes sense, as having more anticipatory guidance and task statements in a sign-out likely increases the chance that the sign-out prepared the hospitalist for potential inquiries and thus was comprehensive enough to be considered sufficient.

A prior study at our institution investigated which types of overnight inquiries medicine house staff receive, and how well the associated sign-outs had aided with these inquiries.<sup>24</sup> Similar to our findings, the majority of the inquiries came from nursing staff. The house staff study found that the largest group of inquiries was order-related, followed closely by “other,” plan of care, medication, and tests/labs. In contrast, we found that

almost half of inquiries were medication-related, with the remaining fairly evenly divided between plan of care, clinical change, and order reconciliation. House staff in the prior study used the written sign-out as a reference for 48% of inquiries and considered the sign-out (either verbal, written, or both) to be sufficient 69% of the time. In our study, hospitalists used the written sign-out about 74% of the time, but considered it sufficient alone for only 30% of the inquiries. The house staff study found that 47% of predictable events were predicted, whereas our hospitalist study found that only 27% of predictable events were predicted. These comparisons suggest that though hospitalists may rely on sign-outs even more frequently than do medicine house staff, hospitalists are finding the sign-out process to be a less useful resource for overnight inquiries than are the house staff, with hospitalist patient events being less frequently predicted by the primary team.

Our study had several limitations. First, it was a single-site study conducted at an academic medical center, and thus the results may not be generalizable to other hospital populations. Second, we had a small sample size, which increased our chance of Type II error. We encountered some challenges in finding hospitalists eligible to participate, as there were a fairly small number of hospitalists working each night and many of them were covering services we had excluded from the study. Our third limitation was that the hospitalist service at Yale-New Haven Hospital uses only written sign-out, rather than verbal sign-out. Though this aided in the purity of our results, it also makes the results difficult to generalize, as some hospitalist services at other hospitals may use verbal sign-out as well. However, as in our prior study, we believe that the written sign-out serves a unique role and should contain certain elements irrespective of having verbal sign-out. Fourth, though our data includes some inquiries about the same patient, we analyzed our

results by inquiry rather than by patient; thus, some sign-out data was included more than once. Finally, we did not control for patients' illness severity, nor did we investigate patient outcomes or the accuracy of anticipatory guidance and tasks. All of these topics can be addressed in future studies.

In conclusion, we studied 124 overnight inquiries addressed to hospitalist physicians to determine the utility and efficacy of written sign-out for hospitalists. Our study revealed a mixed picture about the utility of the hospitalist sign-out. For some inquiries the sign-out was considered unnecessary as a resource; however, for most inquiries the sign-out was considered important but insufficient. We found that sufficient sign-outs most often had a composite score of four and had at least two total anticipatory guidance statements and/or tasks. Future research may examine this same question across multiple institutions, thus hopefully drawing a greater sample size. In addition, these survey responses can be studied in association with patient outcomes.

Future interventions may focus on standardizing education for hospitalist physicians and midlevel clinicians on how to write sign-outs, focusing on the inclusion of information that best addresses the most frequent and clinically important types of inquiries about patients. As medicine continues to witness an increase in transitions of care, and as the hospitalist movement continues to grow, it will be critical to ensure that hospitalist handoffs are conducted in a safe, effective, and efficient way to ensure maximal patient safety.

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## Figures and Tables: specialty sign-out study

### Figures 1-3: Screenshots when scroll down sign-out template at YNHH

Figure 1: Sign-out template

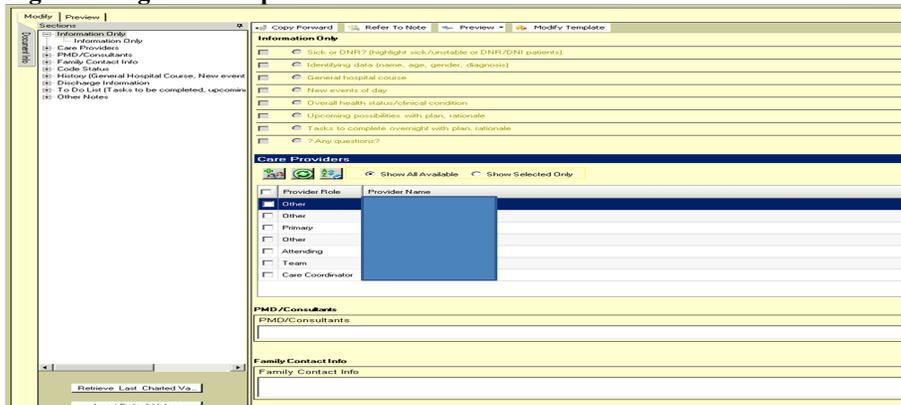


Figure 2: Sign-out template

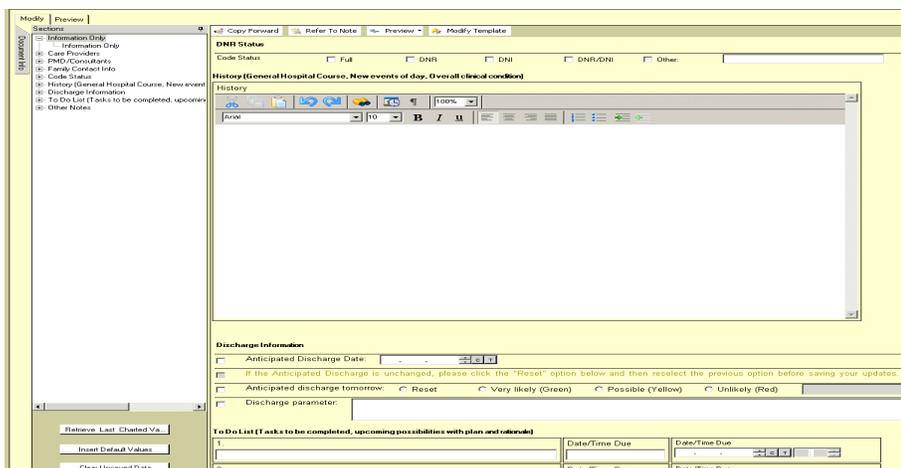
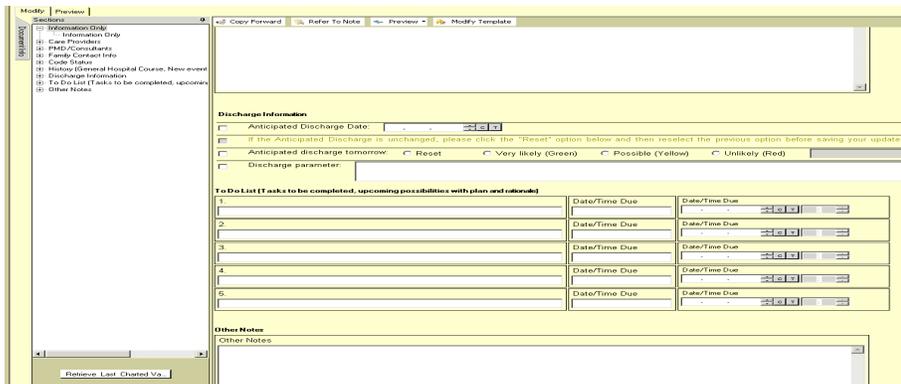


Figure 3: Sign-out template



**Table A: Information included in written sign-out template<sup>17</sup>**

<b>Data field</b>	<b>Method of inclusion</b>	<b>Specialty</b>
SIGNOUT mnemonic	Text at top of note template; not in printed report	All
Location	Automatic feed from EMR	All
Name	Automatic feed from EMR	All
Medical record number	Automatic feed from EMR	All
Admission date	Automatic feed from EMR	All
Gender	Automatic feed from EMR	All
Age	Automatic feed from EMR	All
Weight	Automatic feed from EMR	All
Diet	Automatic feed from EMR	Pediatrics
Visit reason (as input by ED or registration)	Automatic feed from EMR	All
Care providers	Manually select from list of providers assigned to patient including service, primary team, consulting team, attending, resident, intern, PA, care coordinator	All
Resident pager #	Manual entry	Neurology
Allergies	Automatic feed from EMR	All
Code status	Manual entry	All
Family contact info	Manual entry	All
Conservator status	Automatic feed from EMR	All
PMD/Consultants	Manual entry	All
History or Hospital course	Manual entry; option to insert text from progress note	All
Operations	Manual entry; option to insert text from progress note	Surgery
Procedure	Manual entry; option to insert text from progress note	Gynecology, obstetrics
Prenatal labs	Manual entry; option to insert text from progress note	Obstetrics
Oncology history	Manual entry; option to insert text from progress note	Gynecology
Medications	Automatic feed from EMR [optional]	All
Anticipated discharge date	Manual entry	All
Anticipated discharge tomorrow	Manual entry	All but obstetrics and gynecology
Discharge parameters	Manual entry	All but obstetrics and gynecology
Care coordination needs	Manual entry	All but obstetrics, gynecology and psychiatry
W10 [skilled nursing facility paperwork]	Automatic feed from care coordinator note	All
To do list	Manual entry	All
Other notes	Manual entry; option to insert text from progress note	All but gynecology
Hgb, Hct, PT, PTT, Ca, ionized Ca, WBC, bilirubin, cyclosporin level, tacrolimus level	Automatic feed from EMR	Surgery

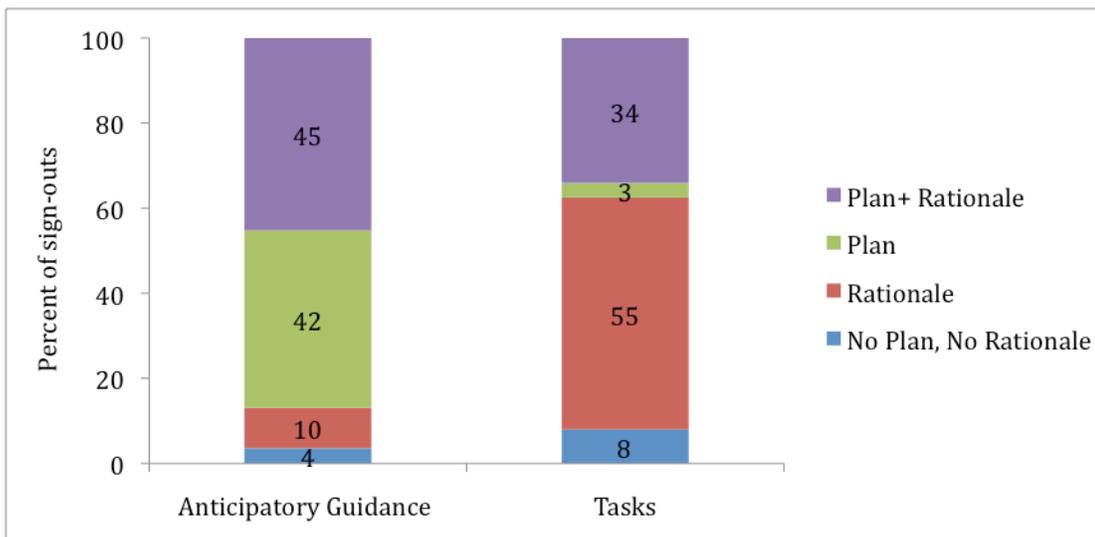
**Table B: Demographics**

	<b>Hospitalists</b>	<b>House Staff</b>	<b>Surgery</b>	<b>Pediatrics</b>	<b>Obstetrics</b>	<b>Gynecology</b>
<b>Total patients</b>	165	165	68	36	41	14
<b>Total sign-outs</b>	165	148	64	36	30	14
<b>% Total patients with sign-out</b>	100	90	94	100	73	100
<b>Total pts admitted &gt;24 hrs prior to data collection</b>	106	100	33	22	14	5
<b>Total sign-outs for pts admitted &gt;24 hrs</b>	106	100	32	22	14	5
<b>% Pts admitted &gt;24 hrs with signout</b>	100	100	97	100	100	100
<b>Sign-out process</b>	Written	Written and verbal	Written and verbal	Written and verbal	Written and verbal	Written and verbal
<b>Main facilitator(s) of sign-out process</b>	PAs/APRNs	Interns and residents	Interns and PAs	Interns	Interns and residents	Interns and residents
<b>Days since admission: Median, days (25th-75th percentiles)</b>	3.0 (1.0-9.0)	5.0 (1.0 - 12.0)	1.5 (1.0 -6.5)	3.0 (1.0-12.5)	1.0 (0.0 - 3.0)	1.0 (0.0 - 8.0)

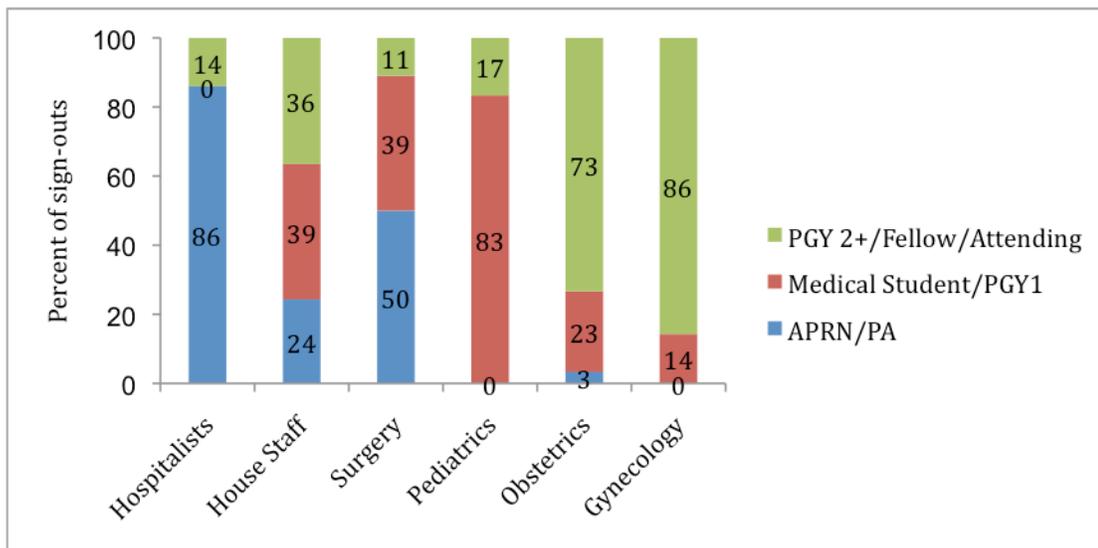
**Table C: Content elements, N (%)**

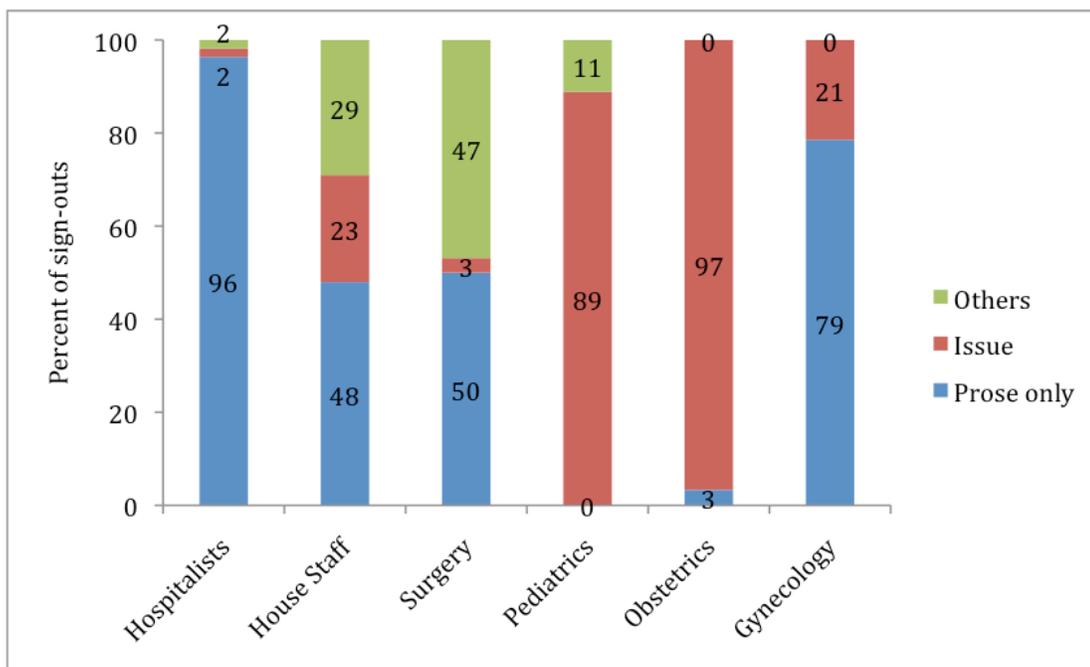
	<b>Hospitalists</b>	<b>House Staff</b>	<b>Surgery</b>	<b>Pediatrics</b>	<b>Obstetrics</b>	<b>Gynecology</b>	<b>P value</b>
Updated within 24 hours of data collection	164 (99.4)	143 (96.6)	59 (92.2)	34 (94.4)	29 (96.7)	10 (71.4)	<0.001
Days since last update, mean (SD)	0.08 (0.3)	0.30 (1.2)	0.58 (1.3)	0.25 (0.6)	0.17 (0.5)	2.21 (3.8)	<0.001
Primary medical doctor	126 (76.4)	103 (69.6)	10 (15.6)	12 (33.3)	2 (6.7)	0 (0.0)	<0.001
Diagnosis	160 (97.0)	142 (96.0)	62 (96.9)	29 (80.6)	29 (96.7)	14 (100.0)	<0.001
Hospital course	149 (90.3)	136 (91.9)	54 (84.4)	36 (100.0)	29 (96.7)	8 (57.1)	<0.001
New events	80 (48.5)	103 (69.6)	47 (73.4)	25 (69.4)	19 (63.3)	7 (50.0)	<0.001
Clinical condition	90 (54.6)	88 (59.5)	22 (34.4)	26 (72.2)	18 (60.0)	8 (57.1)	0.005
Mental status	5 (3.0)	11 (7.4)	1 (1.6)	1 (2.8)	0 (0.0)	0 (0.0)	<0.001
Any anticipatory guidance	11 (6.7)	58 (39.2)	4 (6.3)	14 (38.9)	1 (3.3)	0 (0.0)	<0.001
Any task (includes “nothing to do”)	28 (20.0)	89 (60.1)	14 (21.9)	2 (5.6)	0 (0.0)	2 (14.3)	<0.001

**Figure 4: Medicine anticipatory guidance and tasks- plan and rationale**



**Figure 5: Training of last updater**



**Figure 6: Format****Table D: Chi square analysis of composite score predictors**

Variable		Percent with composite score of 4	P value
<b>Service</b>			0.087
	Hospitalist	49	
	House staff	53	
	Surgery	35	
	Pediatrics	63	
	Obstetrics	38	
	Gynecology	30	
<b>Training</b>			0.020
	Nurse, APRN, PA	46	
	Student, PGY1	59	
	PGY2+, fellow, attending	40	
<b>Days since admission</b>			0.003
	Less than 2 days	39	
	More than 2 days	52	

**Table E: Multivariate analysis of composite score predictors**

		<b>Odds Ratio</b>	<b>Confidence Interval</b>	<b>P value</b>
<b>Service</b>				0.019
	Surgery (Reference)			
	Hospitalist	3.06	1.56 - 6.02	
	House Staff	2.86	1.50 - 5.49	
	Pediatrics	3.12	1.24 - 7.85	
	Obstetrics	3.40	1.30 - 8.91	
	Gynecology	2.40	0.68 - 8.39	
<b>Training</b>	PGY2+, Fellow, Attending			0.014
	Nurse, APRN, PA	0.85	0.49 – 1.48	
	Student, PGY1 (Reference)	1.93	1.05 – 3.55	
<b>Days since admission</b>		1	0.99-1.00	0.36

## Figures and Tables: Hospitalist sign-out study

**Figure 7: Hospitalist survey questions for each inquiry<sup>24</sup>**

MRN:	Who Asked: RN/LPN Patient Family Consultant/Other service Ancillary Staff Other:	How clinically important is this problem? Not at all Somewhat Very	Was written sign-out alone sufficient to answer this question?	If NO, where else did you seek information? (Circle ALL that apply): MD notes Labs/studies Orders Nurse Patient Other:	Was this event/question predicted by Primary team? ***If NO, could this event/question have been predicted?	Yes No Yes No
What Question:			Yes No Not necessary		Did you use a reference source (eg. Uptodate) when addressing this event/question?	Yes No
Date:			How much time did you spend addressing this event/question?		Yes No	

**Figure 8: PA/NP Survey**

1) Please indicate your title (PA/NP): \_\_\_\_\_

2) How many years **IN TOTAL** have you been in practice? \_\_\_\_\_

3) How many years **AT YALE** have you been in practice? \_\_\_\_\_

4) A. Please indicate whether you received training in writing sign-outs **BEFORE** you came to practice at Yale:

Yes

No

B. **IF YES**, how were you trained? (Please check **ALL** that apply):

Lecture

Workshop

In-person feedback sessions

Informal teaching from other practitioners

Other (please describe): \_\_\_\_\_

5) A. Please indicate whether you have received training in writing sign-outs **SINCE** you began to practice at Yale:

Yes

No

B. **IF YES**, how have you been trained? (Please check **ALL** that apply):

Lecture

Workshop

In-person feedback sessions

Informal teaching from other practitioners

Other (please describe): \_\_\_\_\_

**Table F: Demographics of inquiries (N=124)**

	N (%)
Inquiry originator	
Nurse	102 (82)
Patient	13 (10)
Consultant	6 (5)
Respiratory therapy	3 (2)
Inquiry subject	N (% of 122)
Medication	55 (45)
Plan of care	26 (21)
Clinical change	26 (21)
Order reconciliation	15 (12)
Missing	2
Clinical importance of inquiry	N (% of 123)
Very	33 (27)
Somewhat	62 (50)
Not at all	28 (23)
Missing	1
Sufficiency of sign-out alone in answering inquiry	N (% of 121)
Yes	27 (22)
No	62 (51)
Sign-out not necessary for inquiry	32 (26)
Missing	3
Reference(s) used when sign-out insufficient (N= 62)*	N (% of 62)
Physician notes	37 (60)
Nurse	11 (18)
Labs/studies	10 (16)
Orders	9 (15)
Patient	7 (11)
Other	7 (11)
Was the event predicted by the primary team?	N (% of 119)
Yes	17 (14)
No	102 (86)
Missing	5
If no, could this event have been predicted? (N=102)	N (% of 102)
Yes	47 (46)
No	55 (54)
Of all events that could have been predicted, how many were predicted?	N (% of 64)
Predicted	17 (27)
Not predicted	47 (73)
Did you physically see the patient?	N (% of 117)
Yes	14 (12)
No	103 (88)
Missing	7

\*More than one response allowed per inquiry

**Table G: PA/NP sign-out training (N=22)**

	<b>N (%)</b>
Training before YNNH	2 (9)
Lecture Before	1 (5)
Workshop Before	0 (0)
Feedback Before	2 (9)
Teaching Before	2 (9)
Other	0 (0)
Training Yale	21 (95)
Lecture Yale	12 (55)
Workshop Yale	1 (5)
Feedback Yale	11 (50)
Teaching Yale	17 (77)
Other Yale	3 (14)

**Table H: Chi square analysis of predictors of sufficient sign-out (N=89)**

		<b>Number (%) with sufficient sign-out</b>	<b>P value</b>
<b>Question topic</b>			0.001
	Order reconciliation (oxygen/telemetry)	5 (71)	
	Clinical change (vitals, symptoms, labs)	7 (29)	
	Medication (+/- vitals or symptoms)	10 (28)	
	Plan of care (discharge, goals of care, IV, CPAP, procedure)	5 (24)	
<b>Composite score</b>			0.050
	2	0 (0)	
	3	5 (16)	
	4	10 (29)	
<b>Days since admission</b>			0.015
	Less than 2 days	21 (40)	
	More than 2 days	6 (16)	
<b>Clinically important</b>			0.059
	Not at all	8 (50)	
	Somewhat	8 (19)	
	Very	10 (33)	
<b>Anticipatory guidance and tasks</b>			0.006
	2 or more	3 (60)	
	1	3 (14)	
	0	21 (34)	

**Table I: Predictors of sufficient sign-out: multivariate analysis (N=89)**

		<b>Adjusted OR (95% CI)</b>	<b>P value</b>
<b>Question topic</b>			0.58
	Order reconciliation (oxygen/telemetry)	Reference	
	Clinical change (vitals, symptoms, labs)	0.29 (0.01 – 6.70)	
	Medication (+/- vitals or symptoms)	0.17 (0.01 – 3.83)	
	Plan of care (discharge, goals of care, IV, CPAP, procedure)	0.15 (0.01 – 3.37)	
<b>Composite Score</b>			0.51
	2	Reference	
	3	0.97 (0.02 – 40.25)	
	4	2.05 (0.05 – 79.72)	
<b>Days since admission</b>		0.332 (0.09 – 1.19)	0.09
<b>Clinically important</b>			0.86
	Not at All	Reference	
	Somewhat	0.70 (0.12 – 4.08)	
	Very	0.59 (0.09 – 4.04)	
<b>Anticipatory guidance and tasks</b>			0.27
	2 or more	Reference	
	1	0.13 (0.01 – 1.52)	
	0	0.17 (0.02 – 2.18)	

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