SPECIAL FOCUS SECTION: PATIENT SAFETY/QUALITY IMPROVEMENT
Patient Safety/Quality Improvement

Improving Communication Delay of Outpatient Sleep Study Results to Pediatric Otolaryngology Patients and Families

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Abstract

Objective. We undertook this quality improvement project to improve communication of outpatient pediatric sleep study results to families in a consistent and timely manner.

Methods. Based on the Institute for Healthcare Improvement quality improvement methodology, multiple key drivers were identified, including standardizing documentation and communication for sleep study results among the otolaryngology department, sleep center, and families. Meaningful interventions included developing standard electronic medical record documentation and utilizing otolaryngology nurses and advanced practice nurses to assist with communication by sending the results from the sleep center to both the referring otolaryngology provider and the triage nurses. The primary outcome measure was the monthly proportion of sleep studies communicated by the otolaryngology department to families within 3 business days.

Results. Average monthly sleep study results communicated to families within 3 business days increased from 31% to 92.9% over the study period (P < .0001). Sleep study results were personally communicated via telephone and voicemail in 60.88% and 34.0% of cases, respectively. Approximately 50.0% of families receiving voicemails later contacted our department for their children’s study results.

Discussion. Novel documentation strategies and involvement of our entire clinical team (physicians, nurses, and advanced practice nurses), allowed us to significantly improve the consistency and timeliness of our communication of outpatient sleep study results to families in a proactive manner.

Implications for Practice. With time-sensitive clinical test results, such as those from pediatric sleep studies, intra- and interdepartmental collaboration and standardization of the communication process and documentation may allow for more expedient care of children with suspected obstructive sleep apnea.

Keywords

sleep study, polysomnogram, results, obstructive sleep apnea, pediatric, communication, patient safety, quality improvement, PS/QI

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In health care, timely communication is critical to the delivery of safe and effective medical care to patients. Communication problems exist not only among medical staff but frequently between clinical providers and the patients for whom they care. Communication errors represent about 3.8% of errors committed by otolaryngologists and 4% of all medical malpractice claims and litigation nationwide. Communication errors may result in wrong-site surgery, unnecessary procedures, and diagnostic or treatment delay. In a report by the Institute of Medicine, communication delay of clinical test results was recognized as a key safety issue that adversely affects the ability to deliver high-quality care by those who receive and give care.

Communication of diagnostic test results to patients is a common challenge encountered within the busy outpatient practice environment. The process of test ordering, scheduling, and communicating test results to patients is
Within otolaryngology, obstructive sleep apnea (OSA) is a common diagnosis seen in approximately 1% to 3% of children each year. OSA is treated by adenotonsillectomy in approximately 500,000 children per year in the United States. Within pediatric otolaryngology, one is frequently faced with the dilemma of reliably diagnosing OSA in children solely according to subjective parent-reported history. Sleep studies (SSs) are often ordered to help elucidate the presence of OSA in children and subsequently guide treatment recommendations. In a busy pediatric otolaryngology practice, SSs are frequently one of the most common clinical tests ordered. Within our tertiary referral institution, otolaryngology physicians (MDs) and advanced practice nurses (APNs) order approximately 600 to 700 outpatient SSs annually for children with suspected OSA. In the past, wide variation existed in how SS results (SSRs) were communicated to the child’s family once they were received from our sleep center. This lack of standardization of SSR communication typically resulted in significant delay or noncommunication of SSRs, regardless of the OSA severity. The patient’s parents often had to call our department to obtain their child’s SSRs. The aim of this quality improvement (QI) project was to improve the telephone communication delay of outpatient SSRs from otolaryngology providers to patients/families, from a baseline rate of 31% of families contacted within 3 business days to 85% of families and to sustain that rate for 6 months. Ultimately, our department’s collaborative efforts were able to develop and sustain a novel proactive communication process to families that markedly improved pediatric OSA care by decreasing the variability and delay of the SSR communication process.

Methods

Context

A large urban facility, Nationwide Children’s Hospital is a tertiary referral pediatric medical center serving central Ohio and the surrounding state. In 2016, 1.4 million patient visits occurred from 52 countries and all 50 states. During 2016, our pediatric otolaryngology department consisted of 8 full-time and 2 part-time otolaryngology MDs, 16 registered nurses (RNs), and 5 APNs. All otolaryngology providers referred patients for pediatric SSs when appropriate. In 2015, the sleep center, staffed by 6 sleep medicine–trained physicians and 2 APNs, received approximately 3600 referrals, of which 2000 were for a SS. In 2015, 457 SSs (23%) were ordered by otolaryngology providers with our EMR system EPIC (EPIC Systems Corp, Verona, Wisconsin).

Interventions

For this QI project, we targeted only communication of outpatient pre- or postoperative SSs that were ordered by an otolaryngology provider. A list of all study interventions that were undertaken during this QI project to improve our SSR communication rate are documented in Supplemental Table S1 (available in the online version of the article). An example is the development of EPIC SmartPhrases for otolaryngology providers (MDs, APNs) to document SSR report review and formulate treatment plans as well as plans to communicate SSRs to patients and families. We excluded inpatient SSs, as these SSRs would be communicated to the family during hospital admission. We also excluded patients who had sleep center referrals for continuous positive airway pressure or sleep medicine clinic visits. These patients would be primarily treated by the sleep medicine physician, who would presumably communicate all findings from continuous positive airway pressure titration studies or conduct sleep medicine consultations directly with the patients during their clinical encounters. Consequently, we excluded these patients because any future communication with them by our department would likely be redundant. Lastly, SSs not ordered by an otolaryngology provider, such as those by the pediatrician, were excluded. In these instances, SSs would not be routed back to our department if they were not directly ordered by an otolaryngology provider and the patient was unknown to the otolaryngology department. By consensus, a threshold of 3 business days was defined as the expected time for an otolaryngology provider to communicate the SSRs to a family once the SS report was received. This interval was thought to be ample for the provider to review the SS report and communicate the SSRs and treatment plan with the patient’s family. In our EMR, we tracked SS reports by (1) the date when they were finalized and posted by the sleep center staff and (2) the date when any subsequent telephone call was made from the otolaryngology department to the patient’s family to communicate the SSRs.

For our QI project, we identified multiple key drivers to improve our baseline SSR communication process. We devised corresponding interventions tested as multiple PDSA cycles (plan, do, study, act). Figure 1 depicts our key driver diagram. Many of our key drivers focused on improving and streamlining our EMR documentation for SSR communication. In partnership with our institution’s information technology team, we developed novel documentation tools within EPIC to identify a telephone encounter reason as “sleep study results.” Additionally, we developed SSR-specific EPIC SmartPhrases for the otolaryngology providers to concisely document communication of the telephone encounter with the family (for the SS communication SmartPhrases, see Supplemental Figures S1 and S2, available in the online version of the article). If contact with the family was not achieved, voicemail (VM) messages were left for families to call the otolaryngology registered nurse.
(RN) triage line to receive the SSRs and the treatment plan that was documented within EPIC. Two attempts by the otolaryngology provider or designated RN/APN were attempted for this project for each patient. When contact with the family was not possible, a standard certified letter developed for this project was generated within our EMR by the triage RN, printed, and mailed to the family. This informed families of available SSRs and how to contact our department to receive them (for this SSR letter, see Supplemental Figure S3, available in the online version of the article). Letters were translated into Spanish, Arabic, and Somali, the most common non-English languages for families residing in our area. Additionally, the translated letters contained telephone numbers for the interpreter service line at our institution, who would transfer any family’s telephone call to our RN triage line.

We recognized that communication barriers between the otolaryngology and sleep center departments and the families were the most influential key drivers affecting our ability to deliver expedient and consistent SSR communication. To address these barriers, we utilized our otolaryngology RNs and APNs, who were positioned as the vanguard in this new SSR communication process. This was partially formulated in response to providers’ potential unavailability because of conferences, vacations, and other academic/clinical responsibilities that interfered with their ability to deliver immediate communication of SSRs to families following SS receipt. QI process changes involved sending patient SS reports from the sleep center simultaneously to the ordering provider and to the daily triage nurse pool via our EMR. This change involved education and collaboration with the sleep center administrative staff and physicians to redesign their communication protocol for sharing their SS reports with our department. In our otolaryngology department, typically 2 outpatient RNs and 1 APN served in the daily capacity of telephone triage RN/APN, who respond to patient telephone calls requests and assist in clinical care coordination. Upon implementation of this new process, receipt of an SS report by the triage RN triggered the use of an EPIC SmartPhrase whereby the SS report was documented “received” and date- and time-stamped. Notification of the “received” SS was immediately forwarded to the designated daily triage APN via the EMR. The triage APN then reviewed the SS report and either made clinical recommendations for the patient based on the SS findings or developed a treatment plan jointly with the ordering otolaryngology provider. If the ordering provider was unavailable, the triage APN had the discretion to call and review the SSRs with the family or schedule a follow-up appointment with the child’s otolaryngology provider. However, the APN frequently communicated the plan with the patient’s family within 3 business days and documented this plan by utilizing the EPIC SSR SmartPhrase. If the APN was unable to reach the family, this task was reassigned to the triage RNs to assist in additional attempted telephone communication of the treatment plan as documented by the triage APN.

Study of the Intervention and Measures
To measure our rates of SSR communication to families within 3 business days following SS receipt, we developed and used multiple EPIC SmartPhrases for this project. SmartPhrases documented initial receipt of SS reports from the sleep center for each patient by the triage RNs and served to mark the initiation of the 3-business day window. When telephone communication was not possible or resulted in 2 unsuccessful attempts, standardized/certified letters were drafted and mailed to the families. By measuring the difference between the time when SS reports were

**Figure 1.** Key driver diagram. APN, advanced practice nurse; EMR, electronic medical record; ENT, otolaryngology; RN, registered nurse; SC, sleep center; SS, sleep study; SSR, sleep study results.
initially received by our department and when they were subsequently documented as communicated or attempted to be communicated to the family, we were able to determine the proportion of families receiving their telephone communication of SSRs within 3 business days. For this project, we considered an attempt at communication successful when the otolaryngology provider (1) personally spoke with the patient’s family to deliver the SSRs, (2) left a VM to instruct the family to call our office for SSRs or a VM delivering normal SSRs, or (3) had a standardized/certified letter sent to the family’s address informing the parents of available SSRs for their child. In the latter 2 instances, families could call the triage RN line to obtain or further discuss these SSRs that were previously documented in EPIC by the provider. At monthly intervals, a list of all otolaryngology-ordered outpatient SSRs was electronically generated by our institution’s electronic data warehouse as well as the date of the first attempted telephone call for each patient. We identified and tracked SSR-specific telephone encounters by the encounter description “sleep study results.” The reports were transmitted to our department for additional manual data review, if required. Additionally, throughout the project, we tracked the monthly frequencies of who made the first attempted telephone calls to families, such as the MD, APN, or RN. For a balancing measure, we tracked monthly percentages of how often our APNs required consultation and input/advice from MDs prior to contacting families via telephone. Our goal for this project was to achieve 85% of SSRs communicated to families within 3 business days after SS receipt by our department and to sustain that rate for at least 6 months.

Analysis

We used statistical process control with our primary process measure of documented SSR communication within 3 business days and plotted the data on a p-chart. Established rules for differentiating special versus common cause variation were also used for this p-chart with Minitab 17.1 (Minitab Inc, State College, Pennsylvania). We calculated the proportion of monthly SSRs communicated to families within 3 business days following SS receipt versus completed monthly ordered SSRs. We compared baseline communication of SSRs to our new communication process using Fisher’s exact test.

Ethical Considerations

This work was presented to, reviewed by, and exempted by Nationwide Children’s Hospital’s Institutional Review Board panel.

Results

SSR Baseline

Otolaryngology departmental communication of outpatient SSRs occurred at a frequency of 1 per day in 2015. Supplemental Table S2 (available in the online version of the article) lists the historical manner for SSR communication to families prior to this QI study. In 2015, out of 457 SSs, SSRs were communicated via clinic visit versus telephone call for 120 versus 275 patients, respectively. Of the 457 otolaryngology-ordered SSs in 2015, 62 (13.6%) SSRs were never documented as communicated to families; however, 15 patients (22.6%) from these 62 SSs proceeded to schedule surgery. This observation suggests that actual SSR communication occurred but clinical documentation by the provider was deficient. For the other 47 of 62 patients (75.8%), given that no documentation existed for SS communication to the families by our department, we were uncertain SSRs were ever received by families following SS completion. In 2015, approximately 10% of all SS telephone communication occurred secondary to apprehensive families calling to inquire about their children’s SSRs >2 weeks after SS completion. For SSRs communicated via a follow-up clinic appointment, approximately 10% of families returned to the clinic for SSRs only to discover that the ordering provider had not yet received the SS report from the sleep center. Similarly, 15% of patients who were told to self-initiate a follow-up clinic visit for their SSRs never returned to the clinic and were lost to follow-up, regardless of the SSR severity; approximately 33% of these SSs showed severe OSA that was never treated. As our department had no reliable system for consistently receiving, communicating, and documenting communication of SSRs to families, we undertook this QI project to address these obstacles. Our hope was to improve consistent communication to families of children for whom we ordered SSs to improve parental satisfaction as well as the expediency of any subsequent care for their children. Secondarily, we wished to reduce any future medicolegal liability arising from noncommunicated, untreated OSA in these same patients. Since initiation of this QI project, patients who never received their 2015 SSRs were contacted to communicate their SSRs post hoc.

From March 2016 to December 2017, 951 otolaryngology-ordered outpatient SSs were completed at our institution. PDSAs for our SSR communication process were developed and implemented starting in late February 2016. Figure 2 presents the process flow map for our SSR communication process. This map describes the process by which completed SSs were reviewed by the otolaryngology department and a treatment plan formulated (medical vs surgical). It also details the involvement of multiple otolaryngology providers (triage RN, APN, MD) to communicate SSRs to families via telephone call, VM (if family could not be successfully contacted), or letter. Figure 3 presents the p-chart of our telephone communication of SSRs to families within 3 business days from 2015 to 2017. By March 2016, a statistically significant threshold shift of our baseline SSR communication rate of 31% occurred ($P<.0001$). By May 2016, successful SSR communication to families occurred within 3 business days at a monthly frequency that averaged 92.9% (range, 84%-100%) and was sustained over the ensuing 20 months.

After interventions were implemented, proactive SSR communication occurred via telephone for 889 of 951 (93.5%) patients and via certified mail/letter for 10 of 951 (1.0%), with an average frequency of 0.5 letters sent per
month. Of families receiving letters, 5 of 10 later called our triage RN line for their children’s SSRs. Figure 4 shows the distribution of attempted first telephone calls to families to deliver SSRs. Over 24 months from January 2016 to December 2017, the task of attempted initial telephone contact with families for SSR communication increasingly shifted from the ordering otolaryngology provider and/or delegated RN to the APNs. However, when families could not be initially reached by the APN, subsequent attempts at telephone communication of SSRs was more equally shared between the APNs and RNs.

Over the study period, of the 951 SSRs communicated via telephone, 579 (60.9%) of patients/families were able to be primarily contacted within 2 telephone calls. This was often attempted once daily by the RNs, APNs, or MDs when the patient could not be reached on the initial
telephone attempt. VM messages delivering SSRs or instructing families to call for the SSRs were left for 323 of 951 (34.0%) of families, of which 50.8% later called our triage RNS to obtain their children’s SSRs. Upon calling back, 92.0% of families had their children’s SSRs personally communicated to them by the triage RNS or APNs. **Figure 4.** First telephone calls to families by the otolaryngology APNs, RNs, and physicians over the study interval. APN, advanced practice nurse; ENT, otolaryngology; RN, registered nurse; SSR, sleep study result.

**Discussion**

Our study reports multiple process changes and interventions that improved the communication of pediatric SSRs to families in a timely and proactive manner. Since March 2016, these process changes have been successful in improving our SSR communication rates to families from a mean baseline of 31% within 3 business days to 92.9%. Furthermore, over the past 22 months, we consistently sustained this communication rate on a monthly basis. We attribute these successes to multiple interventions, which included standardizing documentation of our SSR communication, involvement of our APNs and RNs to help communicate SSRs to families, as well as having the SS report simultaneously transmitted to our triage RNs and the APNs. All interventions expedited and improved the reliability of communication attempts, documentation, and delivery of SSRs to families. From our study, SSR communication occurred via person-to-person telephone contact with families at a rate of 78.2% (744 of 951). This rate included primary and subsequent telephone SSR communication with the family by our APNs, RNs, or MDs. To the best of our knowledge, this is the first QI project that involved a multifaceted and comprehensive approach for proactive and timely communication of such results to families.

During the development phase of the project, the first cornerstone question that our QI group addressed was the interval of time, post-SS receipt, that was considered reasonable and practical to communicate SSRs to families by our department. For our project, in the absence of published guidelines for acceptable latencies for SSR communication, we decided on 3 business days from the date of SS report receipt, which excluded weekends and holidays. Intervals >3 business days could conceivably prolong SSR communication beyond 1 workweek and delay patient outcomes. For this reason, our group settled on 3 business days. However, for our project, the 3–business day interval did place tight time constraints on our APNs if they needed to speak with the ordering provider before calling the families with their SSRs. Throughout the study, this 3–business day interval became less problematic for the APNs, as **Figure 5** shows APNs requiring progressively less prior MD input before calling families. However, if the allowable timing for SSR communication would have been >5 business days, we suspect that our proportion of communicated SSRs to families would have approached >95% over the study period.

**Figure 5.** Percentage SSRs requiring physician input by the otolaryngology APNs before first attempted telephone call to patient’s family. APN, advanced practice nurse; ENT, otolaryngology; SSR, sleep study results.
additional treatment planning was requested by the family or required per the SSR complexity. In this manner, families received the SSRs in a timely and consistent manner and could act on these results on their own timetable. However, even after the APN originally spoke with the family, the referring provider could later call the family to discuss the SSRs with the family and potentially avoid the need for a follow-up appointment. Employing all these novel strategies, we noted that our historical rate of “reactive” communication of SSRs to families who called to our department to receive the SSRs was nearly eliminated. We are not aware of any negative feedback or dissatisfaction from parents receiving their children’s SSRs via a physician proxy, such as the RN or APN. Parents were overwhelmingly noted by our APNs to appreciate such quick communication of their children’s SSRs and the ability to immediately start implementing treatment recommendations.

Communication delays also arose from inconsistent transmission of SS reports to our department from our Sleep Center. Over the study period, about 1 to 3 SSs per month were never documented as received by our department and thus communicated to the patients or families. Multiple interventions were implemented to address this phenomenon, including simultaneous routing of SS reports to the otolaryngology providers and triage RNs, the latter of whom would date- and time-stamp when the SS reports were received by our department. During the study period, periodic reeducation of the sleep center administrative staff occurred to ensure consistent routing of SS reports to the triage RNs and ordering otolaryngology provider. Unfortunately, SSs that were never communicated to families by the otolaryngology department were not easily trackable within our EMRs to determine where the process failed. For these patients, it was not possible to determine if the triage RN or referring otolaryngology provider ever received the SS reports from the Sleep Center. However, upon further review, we determined that when SSs were routed to the otolaryngology department by anyone other than the lead Sleep Center administrative assistant, the frequency of suspected nonrouted SSs to our department increased slightly per month. The responsibility of SS report transmission to our department has since been reassigned to only the lead Sleep Center administrative assistant, and since this change, variability in the Sleep Center to otolaryngology department communication process has improved. We also established our baseline goal at 85% in lieu of this phenomenon and other potential circumstances that were beyond our control but could interfere with our ability to communicate SSRs within 3 business days.

We developed and required our APNs, RNs, and MDs to universally utilize multiple standard EPIC SmartPhrases that were developed for this QI study. Before embarking on this QI study, we recognized a lack of consistent documentation by all otolaryngology EPIC users when contacting families. Since implementation, these SmartPhrases have markedly enhanced accountability and tracking of all providers who communicate SSRs to families. Since the inception of this project, mean SSR communication has significantly improved to a monthly rate of 92.9% on account of our standardized EPIC documentation.

Communication of SSRs during our study involved multiple forms of communication that collectively improved our ability to deliver these results to families in a timely fashion. At the outset of the project, we suspected that SSR letters would be frequently required to communicate SSRs to families, as most telephone calls are made by clinical departments during daytime work hours, when family members could be unavailable. However, in only 10 cases were letters required over the study period. To our surprise, primary communication of SSRs with families via direct telephone communication was dramatically more successful within 2 attempts by our APNs, RNs, and MDs than originally predicted.

VMs were utilized with only 34.0% of families, if the family could not be directly reached by phone but had a functional answering machine. However, variation existed in how VM messages were utilized during the study period. In some instances, VM messages with SSRs and recommendations were simply left by the APNs, RNs, or MDs if a family possessed an identified voice mailbox. In these instances, families might not be routinely instructed to call our department unless desired. In other situations, according to provider preference, the APNs, RNs, or MDs instructed the family to call our triage RN line for communication of their SSRs. Overall, only 50.8% of families called our triage RN line after receiving a VM. However, it was difficult to determine how often families were instructed to call this line for SSRs but ultimately did not call. It was also difficult to appreciate how often families were not instructed to call the RN triage line but subsequently did so to obtain additional SSR details. Overall, 34% of families received VMs for SSR communication, with 50.8% subsequently calling us for additional information. We reached 60.9% of families primarily by telephone, and 17% (50% of 34%) called back after receiving a VM, which totaled approximately 78.2% of families to whom our department directly and personally communicated children’s SSRs—a proportion higher than what we could have predicted.

**Limitations**

This study focused on proactive communication of SSRs to families within 3 business days after receipt by the pediatric otolaryngology department. We acknowledge that our department comprised 16 pediatric otolaryngology triage RNs and 6 APNs during the study period (2016-2017). We realize that such a large complement of RNs and APNs may not be feasible in some departments, thus limiting the direct translation of this process to other institutions. Other limitations for this study include that our SSR communication process involved communication attempts through VM, letter, or telephone call. When VMs or letters were left or sent to families, we could not guarantee that either form of communication was personally received or processed by the family and any additional action taken. Additionally, variability existed among our MDs,
APNs, and RNs in their communication styles for the delivery of a child’s SSR, including how providers utilized VMs during the study. We did not attempt to analyze if proactive communication of SSRs decreased any subsequent interval to surgery or even affected compliance with treatment recommendations.

Conclusions

The goal of our project was to improve SSR communication to pediatric families within 3 business days after SS receipt by our otolaryngology department. From March 2016 to December 2017, our department’s monthly average SSR communication rate to families within 3 business days improved from 31% to 92.9%. Our most successful PDSA interventions included standardization of EMR documentation and utilization of APNs and RNs to help with SSR communication to families. Additionally, our results were sustainable over the study interval, with minimal additional burden placed on our triage RNs and APNs. We believe that our QI project constitutes the first report within the literature regarding proactive, timely, and consistent communication of SSRs to families.

Implications for Practice

Overall implementation of all interventions significantly improved our proactive and consistent communication of pediatric SSRs. These results are important and of a time-sensitive nature to patients and families and for the delivery of high-quality expedient care for children with suspected OSA. We suspect that the methodology developed for our QI project that improved SSR communication for our pediatric patients is translatable to most other clinician-ordered test results where timely and reliable communication to families is required.

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Author Contributions

James M. Ruda, conception/design, acquisition/analysis/interpretation of data, drafting/revising manuscript; Linda Payne, study design, study analysis, interpretation of study data, drafting/revising manuscript; Anne May, study conception/design, study analysis, interpretation of data, revising of manuscript; Mark Splaingard, study conception/design, study analysis, interpretation of data, revising of manuscript; Stephanie Lemle, study design/conception, study analysis, interpretation of data, revising of manuscript; Kris R. Jatana, study design/conception, study analysis, interpretation of data, revising of manuscript.

Disclosures

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Supplemental Material

Additional supporting information is available in the online version of the article.

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