BRIEF REPORT

Feasible Strategies for Sustaining Guideline Adherence: Cross-sectional Analysis of a National Collaborative

Sunitha V. Kaiser, MD, MSc,[a] Kristin A. Shadman, MD,[b] Eric A. Biondi, MD, MS,[c] Russell J. McCulloh, MD[d]

ABSTRACT

Health care providers' adherence to guidelines declines over time, and feasible strategies for sustaining adherence have not yet been identified. We assessed the long-term feasibility of various strategies for sustaining guideline adherence and described factors influencing their use. We conducted a cross-sectional survey ($N = 104$) of physician leaders who participated in a national collaborative to improve care of infants with suspected sepsis. Data were collected on long-term use of strategies to promote guideline adherence (use, perceived effectiveness, and barriers to use). Sixty (58%) participants from diverse hospital settings responded. There were significant declines in use of quality improvement and educational strategies, largely driven by lack of time or staff resources and competing priorities. Electronic strategies (eg, order sets) and hospital policies or guidelines were feasible to continue long-term after the collaborative ended and were perceived as effective. Clinicians and healthcare leaders should consider prioritizing these strategies in their efforts to improve care and outcomes for children in hospital settings.

[a]Department of Pediatrics, University of California, San Francisco, San Francisco, California; [b]Department of Pediatrics, University of Wisconsin–Madison, Madison, Wisconsin; [c]Department of Pediatrics, School of Medicine, Johns Hopkins University, Baltimore, Maryland; and [d]University of Nebraska Medical Center, Omaha, Nebraska

Health care providers face many challenges adhering to evidence-based guidelines,[1] and this poor adherence contributes to poor health outcomes for children in hospital settings.[2–4] Effective strategies for promoting providers' initial adoption of guidelines have been identified (eg, educational meetings, audit and feedback).[5] But to reap the full rewards of resources invested into such strategies, we need to also determine how to sustain guideline adherence.[6]

Guideline adherence often declines over time, but little is known about how to prevent this decline.[6,7] A systematic review of sustainability of guideline adherence revealed that only 5 of 14 included studies reported success in sustaining guideline adherence for >1 year, with failures likely due to loss of implementation resources and competing priorities.[7] These declines in adherence may especially impact care and outcomes for children because >70% are cared for in general hospitals, where resources tend to be preferentially allocated to adults.[8,9]

Unfortunately, we have a limited understanding of how to promote robust, sustained guideline adherence and high-quality care.[6] Most studies of strategies to improve pediatric guideline adherence have <1 year of follow-up. The few studies with long-term follow-up were done at children's hospitals, and authors described resource-intensive approaches that included many strategies (electronic order sets, audit and feedback, opinion leaders, and quality improvement [QI] techniques).[10,11] Such approaches are unlikely to be feasible across diverse hospital settings, many of which lack a robust QI infrastructure. Identifying feasible, effective strategies for sustaining guideline adherence across diverse settings, including general hospitals, could improve care broadly for all children.

Our objectives for this study were to (1) assess the feasibility of various strategies for sustaining pediatric guideline adherence by using a diverse national sample of hospitals and (2) describe factors influencing the long-term use of these strategies. These findings can help

guide future efforts by policymakers, administrators, and health care providers to improve guideline adherence and care for children in hospital settings.

METHODS
Study Design, Setting, and Participants

We conducted a cross-sectional study by surveying inpatient physician leaders from hospitals that participated in a national collaborative to improve evidence-based guideline adherence and quality of care for infants with suspected sepsis. Reducing Excessive Variability in the Infant Sepsis Evaluation (REVISE) was led by the Value in Inpatient Pediatrics Network within the American Academy of Pediatrics (AAP).[12] A total of 133 hospitals participated in REVISE from December 2016 to November 2017. Multidisciplinary provider teams used several strategies to promote guideline adherence, including educational meetings, clinical pathways, electronic order sets, audit and feedback, a mobile device–based clinical decision-support application,[13] and external facilitation ("coaching") by QI experts. The AAP provided support for these strategies during the collaborative (eg, data platform for audit and feedback, external facilitators).

We surveyed REVISE inpatient physician leaders in October 2018, 11 months after the collaborative ended. The survey was electronically distributed to leaders (N = 104) of sites that completed collaborative activities (REDCap, version 8.10; Vanderbilt University, Nashville, TN). This study was approved by the American Academy of Pediatrics Institutional Review Board.

Data Collection

The survey (Supplemental Fig) was used to collect data on strategies to promote guideline adherence used during the collaborative and continued long-term after the collaborative and associated supports ended. The survey was β-tested and refined by using feedback from a national panel of 10 pediatric hospitalists. Strategies that were asked about included QI strategies (eg, plan-do-study-act cycles), educational and/or training strategies (eg, skills training), electronic strategies (eg, order sets), and

organization-level strategies (eg, development of hospital policies). These quantitative data were collected by using "yes or no" questions. In addition, qualitative data were collected on perceived effectiveness and barriers to continued use of these strategies via 2 optional questions (free-text responses): "What strategies helped sustain guideline adherence and high-quality care after the end of the collaborative?" and "Why are these strategies no longer being done [after the collaborative has ended]?"

Outcomes and Analysis

Our primary outcome was use of strategies after the collaborative ended, which was interpreted as long-term feasibility. We compared use rates of each strategy during versus after the collaborative using χ^2 and Fisher's exact tests (when $n \leq 5$). We analyzed perceived effectiveness and barriers to continued strategy use by using thematic content analysis (ATLAS.ti, version 7.5.18; Scientific Software Development GmbH, Germany).

RESULTS

Project leaders (N = 104) from 68 children's hospitals and 36 general hospitals were surveyed, and 60 (58%) responded. There was no difference in response rate by hospital type (P = .75). Hospitals represented all regions of the United States and varied widely in size (4–500 pediatric beds).

Use of Strategies to Promote Guideline Adherence During Versus After the National Collaborative

Strategy use during versus after the collaborative is presented in Table 1. Sites commonly used QI and educational and/or training strategies during the collaborative, with several strategies used by >70% of responding hospitals. Use of these types of strategies declined significantly after the collaborative and associated supports ended.

Participants commonly reported long-term use of electronic strategies (mobile application, order sets). Approximately half of responding hospitals used these strategies during the collaborative, and these use rates were maintained after the

TABLE 1 Strategies to Promote Guideline Adherence Used During Versus After the National Collaborative (N = 60 Hospitals)

Strategy by Type	Used During Collaborative, n (%)	Used After Collaborative, n (%)	P[a]
QI strategies			
Collection of local data on quality metrics	53 (88)	18 (30)	<.001*
Feedback and/or review of local data reports with health care providers	42 (70)	22 (37)	<.001*
QI planning meetings of local project leaders	42 (70)	20 (33)	<.001*
Use of QI techniques (eg, plan-do-study-act cycles)	32 (53)	10 (17)	<.001*
Training in QI for project leaders and/or other health care providers at your hospital	24 (40)	7 (12)	<.001*
Educational and/or training strategies			
Reminders of best practices from local project leaders or other opinion leaders	47 (78)	36 (60)	.03
Didactic education (eg, conference or slide presentation) for project leaders and/or other health care providers at your hospital	44 (73)	22 (37)	<.001
Skills training (eg, interactive training session with simulation) for project leaders and/or other health care providers at your hospital	4 (7)	1 (2)	.36
Electronic strategies (decision support or quality monitoring)			
Use of a mobile application	35 (58)	27 (45)	.14
Use of an order set in the electronic medical record	26 (43)	31 (52)	.36
Use of a report or dashboard in the electronic medical record	6 (10)	4 (7)	.74
Use of electronic medical record alerts (eg, best practice alerts)	2 (3)	5 (8)	.43
Organization-level strategies			
Development or use of a hospital policy or guideline	32 (53)	24 (40)	.14
Involvement of hospital senior leaders	22 (37)	10 (17)	.01
Funding or provision of resources for provider incentives, data collection, QI support, IT support, or project leaders' time	8 (13)	3 (5)	.20
Other strategies			
Use of visual banners and/or handouts	21 (35)	17 (28)	.11
Involvement of families (eg, family advisory council) in planning and implementing the project	1 (2)	1 (2)	.99

IT, information technology.
[a] Calculated by using the χ^2 test or Fisher's exact test if the frequency was <5.
* Statistically Significant

collaborative ended. Use of order sets increased after the collaborative ended.

Long-term use of strategies by hospital type is presented in Table 2. There were no significant differences by hospital type.

Perceived Effectiveness and Barriers

The majority of participants (n = 45; 75%) provided free-text answers on perceived effectiveness and barriers to continued use

of these strategies. The most common themes that were identified and exemplary quotes are presented below and in Table 3.

Perceived Effectiveness

Theme 1: Project leaders viewed development of a hospital policy or guideline as helpful in sustaining guideline adherence. Such policies

detailed evidence-based recommendations and roles and responsibilities of health care providers.

Theme 2: Project leaders described the importance of implementing an electronic order set. Order sets provided clinical decision support in real time as providers managed infants with suspected sepsis.

TABLE 2 Long-term Use of Strategies to Promote Guideline Adherence by Hospital Type

Strategy by Type	Children's Hospitals ($n = 40$), n (%)	General Hospitals ($n = 19$), n (%)	P [a]
QI strategies			
Collection of local data on quality metrics	12 (30)	6 (32)	.90
Feedback and/or review of local data reports with health care providers	16 (40)	6 (32)	.53
QI planning meetings of local project leaders	15 (38)	5 (26)	.40
Use of QI techniques (eg, plan-do-study-act cycles)	5 (13)	5 (26)	.19
Training in QI for project leaders and/or other health care providers at your hospital	3 (8)	4 (21)	.20
Educational and/or training strategies			
Reminders of best practices from local project leaders or other opinion leaders	25 (63)	11 (58)	.73
Didactic education (eg, conference or slide presentation) for project leaders and/or other health care providers at your hospital	14 (35)	8 (42)	.60
Skills training (eg, interactive training session with simulation) for project leaders and/or other health care providers at your hospital	1 (3)	0 (0)	.99
Electronic strategies (decision support or quality monitoring)			
Use of a mobile application	16 (40)	11 (58)	.20
Use of an order set in the electronic medical record	21 (53)	10 (53)	.99
Use of a report or dashboard in the electronic medical record	4 (10)	0 (0)	.29
Use of electronic medical record alerts (eg, best practice alerts)	4 (10)	1 (5)	.99
Organization-level strategies			
Development or use of a hospital policy or guideline	18 (45)	6 (32)	.33
Involvement of hospital senior leaders	6 (15)	4 (21)	.71
Funding or provision of resources for provider incentives, data collection, QI support, IT support, or project leaders' time	2 (5)	1 (5)	.99
Other strategies			
Use of visual banners and/or handouts	12 (30)	5 (26)	.77
Involvement of families (eg, family advisory council) in planning and implementing the project	0 (0)	1 (5)	.32

IT, information technology.

[a] Calculated by using the χ^2 test or Fisher's exact test if the frequency was <5.

Theme 3: Availability of a mobile application was reportedly helpful in sustaining guideline adherence. This application was developed by the AAP and distributed free of charge. It contained a risk calculator and evidence-based recommendations for management of infants with suspected sepsis.

Barriers

Theme 1: Lack of time or staffing was a reported barrier to continued use of strategies to sustain guideline adherence. After the collaborative ended, project leaders no longer had time or staff support to continue data collection and/or monitoring, QI cycles, or educational and/or training meetings.

Theme 2: Project leaders also described that competing priorities quickly became a barrier as the collaborative ended and team members were assigned new tasks.

Theme 3: Some project leaders described feeling that guideline implementation was complete. This perception contributed to the discontinuation of strategies to sustain guideline adherence.

DISCUSSION

In this national study, we found that electronic strategies and hospital policies or guidelines were the most feasible long-term strategies and were perceived as helpful in sustaining guideline adherence. In

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TABLE 3 Perceived Effectiveness and Barriers to Continued Use of Strategies to Promote Guideline Adherence

Theme	Exemplary Quote
Question: "What strategies helped sustain guideline adherence and high-quality care after the end of the collaborative?"	
Development of a local policy or guideline	"We developed a clinical guideline… [and] we routinely review these as a way to ensure sustainability."
Implementation of an electronic order set	"Development of an order set has been the most helpful in sustaining the improvements; it reduces practice deviation."
Availability of an externally developed mobile decision-support application	"The [application] really helps. It's a point-of-care resource that ED attendings and residents can use to appropriately work up the patient even before the pediatric hospitalist sees him/her."
Question: "Why are these strategies no longer being done [after the collaborative ended]?"	
Lack of time or staffing	"We are not doing formal data collection and review due to lack of resources for chart reviews. This precludes using quality improvement methods (plan-do-study-act cycles) and review of data reports."
Competing priorities	"We local project leaders stopped meeting at the end of the intervention period and everything that goes along with it, as it became lower priority given other needs on our time."
Perceptions that guideline implementation is complete	"When the project ended and demonstrated [we reached our quality of care goals], we no longer felt the effort involved in ongoing data collection and plan-do-study-act cycles was worth expending."

ED, emergency department.

contrast, QI and educational strategies to promote guideline adherence declined over time because of many barriers, including lack of time or staffing and competing priorities.

To our knowledge, this is the first multicenter study of feasibility of strategies to sustain pediatric guideline adherence. Previous single-center studies of sustained guideline adherence report intensive approaches that included multiple strategies such as data collection and/or monitoring, audit and feedback, QI methods, order sets, and reminders from local project leaders and/or opinion leaders.[10,11] Use of most of these strategies declined significantly over time in our analysis. This may be because we studied a diverse, multicenter, national sample.

We found that most hospitals in our study (63%) did not have a system for monitoring guideline adherence after the collaborative ended, and such monitoring is likely fundamental to ensuring sustained guideline adherence and high-quality care.[14] Project leaders reported loss of resources (time, staff) as a top reason for discontinuing data collection and quality monitoring. Loss of resources may be even more common in general hospitals.[8] Few hospitals (7%) were able to use electronic strategies for monitoring (eg, reports, dashboards). Such monitoring strategies may require less ongoing time commitment by health care providers (after the initial setup). In future work, investigators should evaluate the feasibility and effectiveness of such strategies.

We also found that electronic strategies (order sets, mobile applications) were feasible to use long-term and that order set use increased over time. This latter finding suggests a long lag time (>1 year) in order

set implementation. Authors of previous studies have similarly reported poor technology support and consequent delays in implementing pediatric order sets and other electronic health record modifications such as reports and dashboards.[8] Those leading efforts to improve evidence-based care and outcomes for children in hospital settings should consider prioritizing resources for timely implementation of order sets and other electronic health record modifications.[10] Future research is needed to understand how to optimize order set design and effectiveness in sustaining guideline adherence and high-quality care.

Our study revealed the use and feasibility of strategies to sustain guideline adherence but not the effectiveness of these strategies. These findings may have differed in hospitals that chose not to participate in this study or those that did not complete collaborative activities (not sampled).

CONCLUSIONS

Electronic strategies and hospital policies or guidelines were feasible long-term strategies and were perceived as helpful in sustaining guideline adherence. Those seeking to improve care and outcomes for children in hospital settings should consider prioritizing these strategies. Future research is needed to determine what strategies are most effective in sustaining guideline adherence and high-quality care.

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