

Optimising drowning prevention counselling through a physician Maintenance of Certification (MOC) quality improvement (QI) initiative

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ABSTRACT

Drowning is the leading cause of death in children 1–4 years old in the USA. Paediatricians play an important role in giving anticipatory guidance on drowning prevention. This quality improvement initiative aimed to increase the rate of drowning prevention counselling with provision of educational materials to caregivers of children aged 0–10 years during clinical encounters in an outpatient setting. We refined a previously published Texas state educational programme that included evidence-based counselling strategies across three Plan Do Study Act (PDSA) cycles, with the addition of preintervention baseline counselling phase during expansion of the programme nationally to 17 and 21 states in 2022 and 2023, respectively. All participating paediatricians in office-based, urgent care and emergency settings completed demographic, preintervention and postintervention and programme evaluation surveys. Paediatricians in office-based settings (majority of participants) tracked counselling rate across baseline and three PDSA cycles. Caregivers completed postintervention surveys on knowledge and anticipated behaviour change. Drowning prevention education was supplemented by materials provided to caregivers including brochures and wearable water watcher tags to promote adult supervision.

During the first 2 years of national expansion, 120 physicians and 7886 caregivers participated in the programme. Provision of drowning prevention educational materials to caregivers significantly closed an existing gap. Less than 25% of caregivers reported receipt of brochure/checklist and only 6% water watcher tag at baseline; compared with 98% and over 90%, respectively, after PDSA 3 in both years. 69.3% of physicians were able to efficiently counsel on drowning prevention within 2 mins in 2022 versus 82.1% in 2023 (p value<0.001). Most caregivers found the counselling helpful and planned to use the water safety strategies. We demonstrated a significant increase in mean counselling rate from preintervention phase (26.8%) through end of PDSA 3 (64.9%) in this national programme.

PROBLEM

Drowning is a preventable cause of morbidity and mortality that adversely affects children from a variety of ethnic backgrounds and socioeconomic levels. Drowning prevention

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Evidence-based counselling by paediatricians improves knowledge of caregivers regarding drowning prevention of young children.

WHAT THIS STUDY ADDS

⇒ Quality improvement (QI) methodology using an aim statement and PDSA cycles designed to implement a practice change is a novel way to deliver effective drowning prevention counselling. This programme also provides an opportunity for practising paediatricians to obtain Part 4 American Board of Pediatrics Maintenance of Certification (MOC) credit as an incentive for disseminating drowning specific knowledge to their patients and families.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This QI/MOC programme approach to drowning prevention counselling has the potential to be applied to other injury prevention counselling topics and may help paediatricians overcome the challenge of conducting counselling on multiple injury prevention topics during a time-limited clinical encounter.

is a multipronged approach; no single way prevents drowning. There are six evidence-based drowning prevention strategies recommended by the American Academy of Pediatrics (AAP), with four-sided isolation fencing of pools being the most proven way to prevent drowning. Other important strategies include life jacket use, supervision, swim lessons, Cardiopulmonary Resuscitation (CPR) and lifeguards.^{1 2} Swimming ability has been linked to preventing drowning based on the landmark study of Brenner *et al.*³ However, swim lessons alone do not drown-proof a child and may lead to decreased parental supervision.⁴

Current AAP Bright Futures guidelines recommend drowning as an injury prevention anticipatory guidance topic at well visits between 2 months and 10 years.⁵ However,

there is not a universal standard practice on how to implement this counselling in primary care settings, which leads to variable processes across clinical sites.

We developed our intervention to disseminate these evidence-based strategies through concise drowning prevention messaging, supplemented by patient education materials, across three PDSA cycles. Our Specific, Measurable, Attainable, Relevant, and Timely (SMART) aim was to increase drowning prevention counselling rate in primary care settings, including provision of materials to caregivers of children aged 0–10 years, from baseline to 75% in 6 months. As a secondary goal, we strove for 90% and 80% correct drowning prevention knowledge questions on postintervention surveys of physicians and caregivers, respectively, monitored as a process measure to inform counselling accuracy.

This paediatrician QI initiative began as a Texas-wide project that expanded as a national programme intending to make an even greater impact on drowning prevention. During 2022 and 2023, 45 and 75 physician participants, respectively, completed the programme and counselled over 3000 families annually. Participants included general paediatricians in the office and urgent care setting; and general paediatricians or paediatric emergency medicine physicians in the emergency department setting. These participants represented 17 (2022) and 21 (2023) US states and territories (including Puerto Rico), with diverse patient populations in rural and urban/suburban settings and various practice types (academic, private, underserved).

BACKGROUND

Drowning is the world's third leading cause of death from unintentional injury.⁶

According to the WHO report 2017, drowning risk was highest in children 1–4 years of age and second highest in children 5–9 years of age.⁶ For every fatal drowning in the age group of 1–4 years, there are eight non-fatal drownings.^{7–9} This may adversely affect future health of the child, specifically poor neurological outcomes.⁹

It is well recognised that paediatricians have an important role in educating parents and caregivers on dangers from unintentional injuries such as drowning and other modalities as leading causes of death in young children. Non-fatal injuries and long-term morbidities also cause physical, emotional and financial harm to children and their caregivers, with disproportional impact on minority children and those from poor families.⁵ Parents may often underestimate motor milestones and overestimate cognitive abilities when children are in fact unable to anticipate circumstances surrounding injuries, which can be addressed by the paediatrician during health supervision visits.

A literature review of drowning prevention counselling initiatives demonstrated parental misconceptions¹⁰ that were impacted by educational initiatives and tools. A water watcher toolkit was developed with a smart

phone application and a designated water watcher tag. The application prevented incoming calls and texts, use of games and social media to reduce distractions and a 911 quick dial button. The toolkit was acceptable to caregivers and is a promising use of technology to assist appropriate supervision of children in and near water.¹¹ Recent inclusion of water sports in preparticipation physicals screening for medical conditions such as seizures and cardiac arrhythmias provides another opportunity for more focused counselling on drowning prevention.¹²

A 25-year review of office-based injury prevention counselling practice reported changes in knowledge/behaviour and injury outcomes for children less than 5 years of age.¹³ Tailored internet-based counselling was found to be superior to general office counselling,¹⁴ although our pilot and regional project has reported such in-person counselling to be effective.^{15 16} Another QI collaborative programme was effective in increasing injury prevention anticipatory guidance in a paediatric practice for 2–12 months old and awarded part 4 MOC credit to participants.¹⁷ With this precedent, we developed our QI initiative on drowning prevention specific anticipatory guidance to include part 4 MOC credit, as we hypothesised this would provide an incentive for participants to increase their counselling rates.

MEASUREMENT

In our QI programme, we evaluated three measures through physician and caregiver survey collection, data analysis and generation of a counselling rate control chart. The programme consisted of a baseline period and three PDSA cycles, each 6 weeks long.

Our outcome measure was provision of the water safety educational materials to families along with drowning prevention counselling. This was tracked via the rate of families counselled on drowning prevention by assessing the numerator of patients 0–10 years who received counselling on drowning prevention at their well child visit over the denominator of total patients 0–10 years who presented for a well visit. This data was collected weekly by participating paediatricians in an office-based setting, by entering their numbers of total patients seen and counselled into a counselling rate survey in the electronic database.

The process measure evaluated in this programme was attainment of drowning prevention knowledge of both physician participants and caregivers by looking at the percentage of knowledge-based questions answered correctly on postintervention surveys. Monitoring progress of the caregiver survey results over the PDSA cycles allowed us to assess the accuracy of the drowning prevention content being delivered and assist participants with tailoring the counselling in specific content areas. Physician knowledge on postintervention surveys was compared with their preintervention surveys to assess for any knowledge change at completion of the programme,

and postintervention surveys of caregivers were also assessed.

The balancing measure for this QI initiative was time in minutes required for participants to perform counselling, ensuring our intervention did not have an adverse effect of significantly increasing duration of the clinical encounter. Participating physicians self-reported an estimated time in minutes spent counselling each caregiver as a field in the electronic database within each caregiver survey entered. Given that participants were functioning in various clinical environments with different workflows and electronic medical records that we were unable to access, this was the only feasible method for us to track a time-bound measure as a surrogate for the clinical encounter duration. These times were reviewed at participant webinars throughout PDSA cycles to assess for improvement and efficiency of counselling over time as participants became more comfortable and adept at delivering their drowning prevention messaging.

Data entry and validation

Data was entered electronically via surveys in the REDCap database by each participating physician. Constraints were built into the surveys to require data entry for each field to ensure completeness, and also to ensure the denominator in the weekly counselling rate survey was a non-zero integer. If a physician was on vacation or did not see well child visits during a particular week, there was an option to select where the survey's branching logic would not open a counselling rate entry for that week. Our data administrator reviewed the database at least monthly to perform validation and identify any errors that needed to be addressed by the individual physicians.

Data analysis

Post-surveys from caregivers were compared across PDSA cycles and years (2022–2023). Responses consisted of multiple choice and Likert-based responses. For multiple choice questions, raw frequencies and percentages are provided. For Likert-based responses, medians and IQRs are reported. Continuous variables were analysed using the Kruskal-Wallis test after assessing a skewed distribution. For categorical variables, the Pearson χ^2 test was used. A p value <0.05 was considered statistically significant. Special cause variation rules were used to analyse our control chart.

Baseline data

During the baseline phase, participants were asked to maintain their usual practices regarding drowning prevention. Participants continued to counsel and provide educational materials if that was already part of their practice, or not doing so if it was not routine. The only exception was that all participants were required to collect 15 caregiver surveys during baseline even if counselling was not their usual practice. Because this represented a small fraction of well visits over the 6-week period, we anticipated that any impact on overall

counselling rates would be negligible. Our baseline data demonstrated a mean preintervention phase counselling rate of 26.8%, caregiver receipt of drowning prevention materials at 22.3% (2022) and 15.2% (2023) (brochure) and 6.9% (2022) and 6.6% (2023) (water watcher tag).

DESIGN

The opportunity for injury prevention counselling already exists at well child visits and therefore was used for dedicated drowning prevention education. However, paediatricians are overburdened with counselling in time-limited patient visits and are not able to focus on all preventative injuries. After participating in this programme, we hypothesised that paediatricians would gain the knowledge and skill to impart drowning prevention counselling within 1–2 mins so they would be more inclined to continue this in their practice. It was hypothesised that the counselling time would decrease throughout PDSA cycles and potentially year to year. It was also hypothesised that after intervention, counselling rate would increase across PDSA cycles to a target of 75% based on our aim statement. The QI team consisted of physician leaders, programme manager, data administrator and QI/MOC coordinator. Patients or the public were not involved in the design, reporting or dissemination plans of this initiative. Caregiver survey responses following physician counselling were used to inform future PDSA cycles.

Participants in this programme engaged in brief, focused caregiver counselling on drowning prevention during paediatric clinical encounters across diverse patient populations. In order to strengthen our educational intervention, we paired the drowning prevention counselling with tangible drowning prevention materials provided to families. The educational materials included an informational trifold brochure with drowning prevention strategies, wall posters for the clinical space (pool barriers and layers of protection) and wearable water watcher tags with a wrist coil. The posters were used as visual aids to facilitate the conversation regarding drowning prevention. The brochure supplemented the counselling received by their paediatrician with eye-catching graphics and statistics, along with bullet points to reiterate the multiple layers of protection needed to prevent drowning. The water watcher tags with a wearable wrist coil were a practical means for caregivers to promote adult supervision of their children in the water. All materials were available in both English and Spanish to facilitate engagement with a minority patient population, especially important for participants in states with high drowning rates such as Texas and Florida. Caregivers were provided with the caregiver survey (English and Spanish versions available) which was collected at the conclusion of their visit (tables 1 and 2).

We developed a one-page implementation guide and an example process map to assist participants in engaging with their staff to develop the counselling process within each clinical setting. We shared suggested talking points

Table 1 Caregiver experience via surveys across PDSA cycles and years (2022–2023)

Question	Year	Baseline n (%) or median (IQR)	PDSA 1 n (%) or median (IQR)	PDSA 2 n (%) or median (IQR)	PDSA 3 n (%) or median (IQR)
Did the doctor/clinic staff talk to you about drowning prevention/water safety? Yes*	2022	418 (89.5)	905 (98.7)	906 (99.6)	899 (99.7)
	2023	637 (51.7)	1150 (98.2)	1139 (99.0)	1124 (98.9)
Did you receive a water safety brochure/checklist? Yes*	2022	104 (22.3)	872 (95.1)	890 (97.8)	888 (98.4)
	2023	187 (15.2)	1128 (96.3)	1122 (97.6)	1124 (98.9)
Did you receive a water watcher tag? Yes*	2022	32 (6.9)	840 (91.6)	857 (94.2)	827 (91.7)
	2023	81 (6.6)	1108 (94.6)	1089 (94.7)	1082 (95.2)
I found the information regarding water safety to be helpful†	2022	5 (4–5) SA=272 (59.9)	5 (5–5) SA=758 (82.8)	5 (5–5) SA=790 (86.8)	5 (5–5) SA=779 (86.4)
	2023	4 (1–5) SA=514 (41.7)	5 (5–5) SA=1023 (87.4)	5 (5–5) SA=1045 (90.9)	5 (5–5) SA=1032 (90.8)
I learnt new information about drowning prevention today from the doctor†	2022	4 (3–5) SA=223 (49.2)	5 (5–5) SA=692 (75.5)	5 (5–5) SA=703 (77.4)	5 (5–5) SA=696 (77.2)
	2023	3 (1–5) SA=396 (32.1)	5 (5–5) SA=924 (78.9)	5 (5–5) SA=900 (78.3)	5 (5–5) SA=922 (81.2)
I plan to use the water safety suggestions I heard today†	2022	5 (4–5) SA=291 (64.1)	5 (5–5) SA=772 (84.2)	5 (5–5) SA=795 (87.4)	5 (5–5) SA=786 (87.1)
	2023	4 (1–5) SA=553 (44.9)	5 (5–5) SA=1047 (89.4)	5 (5–5) SA=1046 (91.0)	5 (5–5) SA=1047 (92.2)

All χ^2 and Kruskal-Wallis p values were significant (<0.001).

*Responses include yes, no and maybe.

†5-point Likert-based scale responses: (1) strongly disagree, (2) somewhat disagree, (3) maybe, (4) somewhat agree, (5) strongly agree.

PDSA, Plan Do Study Act; SA, strongly agree.

to incorporate into the participants' individualised drowning prevention counselling script.

During both years of the programme, participants counselled and then surveyed 15 patients each during baseline and three PDSA cycles for a total of 60 caregivers. Data from each survey was entered into the electronic database. Additionally, physicians completed a demographic

survey, preintervention and postintervention survey at the beginning and end of the programme to assess their knowledge about drowning, a counselling rate survey for primary care paediatricians and postcourse evaluation survey.

Physicians were also required to attend five out of seven monthly webinars facilitated by physician leaders as

Table 2 Actions caregivers intend to take to increase water safety for their child (N=7886)

Actions	Year	Baseline n (%)	PDSA 1 n (%)	PDSA 2 n (%)	PDSA 3 n (%)
Have an adult within arms' reach directly supervise every child in or near water at all times	2022	414 (88.5)	857 (93.5)	863 (94.8)	853 (94.6)
	2023	1139 (92.5)	1122 (95.8)	1092 (95.0)	1094 (96.3)
Use US Coast Guard approved life jackets/flotation devices, but not in place of direct supervision	2022	317 (67.7)	754 (82.2)	755 (83.0)	749 (83.0)
	2023	950 (77.1)	969 (82.7)	966 (84.0)	999 (87.9)
Enrol myself and/or family members in a CPR course or use previous/current CPR training	2022	301 (64.3)	672 (73.3)	670 (73.6)	676 (74.9)
	2023	894 (72.6)	897 (76.6)	894 (77.7)	918 (80.8)
Enrol my children in swimming lessons, if possible	2022	359 (76.7)	784 (85.5)	774 (85.1)	756 (83.8)
	2023	1035 (84.0)	1025 (87.5)	1012 (88.0)	1012 (89.1)
Check to see if home/family pools have four-sided isolation fences and self-latching gates	2022	311 (66.5)	721 (78.6)	728 (80.0)	737 (81.7)
	2023	928 (75.3)	948 (81.0)	949 (82.5)	948 (83.5)

All Pearson χ^2 p values<0.001.

PDSA, Plan Do Study Act.

part of their MOC requirements. In these webinars, we reviewed data from each PDSA cycle, discussed barriers to implementation of the counselling intervention, shared best practices and reviewed QI methodology and tools that participants could use within their individual settings. We gave presentations on key drowning topics and evidence-based prevention strategies, also inviting nationally and internationally known speakers from a Brazilian lifesaving organisation, National Drowning Prevention Alliance, Young Men's Christian Association (YMCA) swim programme and a community foundation to provide participants with real-life examples and practical resources for families.

STRATEGY

Our SMART aim was to increase the rate of drowning prevention counselling with provision of materials to caregivers of children aged 0–10 years from baseline to 75% across primary care clinical settings in 6 months.

We undertook three PDSA cycles of 6 weeks each. Regular data review at monthly webinars including caregiver survey results, counselling time and counselling rate informed each PDSA cycle. Through sharing best practices and troubleshooting barriers at webinars, physicians collaboratively participated in PDSA cycle planning.

PDSA cycle 1

Plan: The initial goal was to increase physician delivery of drowning prevention counselling through foundational education and implementation tools. Participants were encouraged to engage their clinical teams in developing customised process maps to integrate counselling into their workflows.

Do: An introductory webinar was conducted to educate participants on evidence-based drowning prevention strategies. Physicians received a counselling guide with talking points and educational resources for families.

Study: Mean counselling rate improved from 26.8% (baseline) to 49.4%. However, participants cited key barriers including limited time during visits and challenges with incomplete caregiver surveys.

Act: Participants recognised the need to streamline workflow and reduce counselling time. These findings informed PDSA 2 planning with a focus on optimising team roles and support systems.

PDSA cycle 2

Plan: The counselling process was adapted from PDSA 1 to reduce time burden on physicians by involving clinical support staff and enhancing workflow efficiency.

Do: During the webinar, practices identified workflow opportunities to engage medical assistants or nurses, then operationalised this in their settings. These team members were tasked with identifying eligible patients and preparing materials/surveys ahead of the visit.

Study: Counselling rates increased modestly to 59.5%. Physicians began informally tracking time required for

each counselling session, with many noting small but meaningful improvements in efficiency.

Act: Efforts continued to promote time-tracking and reinforce the value of team-based counselling delivery. Additional refinements were planned to further streamline clinical processes and address time-consuming components of counselling.

PDSA cycle 3

Plan: To further improve efficiency and quality of counselling, PDSA 3 targeted challenging and time-consuming topics such as dry drowning myths and infant swim lessons.

Do: Clinicians reviewed supporting literature, participated in role-play exercises during the webinar, and received vetted resources to guide families in choosing swim programmes. These strategies aimed to build confidence and reduce hesitation when addressing sensitive or controversial topics.

Study: Counselling rates further improved to 64.9%. Most physicians reported the ability to deliver comprehensive counselling in 2 min or less, reflecting enhanced preparedness and efficiency.

Act: Participants were encouraged to continue structured counselling and explore opportunities to embed prompts and resources into clinical systems.

RESULTS

Caregiver surveys: There were 3197 caregivers who participated in 2022 and 4689 who participated in 2023. No demographic data were collected on the caregivers. For their experience with the QI project, regardless of year, significant improvement occurred after baseline (all p values < 0.001) (table 1). Positive responses to water safety counselling and receiving a brochure and water watcher tag were consistently high with 'yes' responses no lower than 90% (table 1). Similar results were seen for the Likert-based responses (table 1). When responding that the information was helpful, new and they planned to use it, baseline data was less than 'strongly agree'. However, for PDSA cycles 1–3, across both years, the median response was 'strongly agree' to all questions (table 1).

Assessing one of our process measures on effectiveness of counselling, differences in aggregate caregiver knowledge were significant in 2023 from half of the median questions (2/4) being correct to three of the median questions being correct (3/4) (results not shown).

Similar to the caregiver experiences, positive responses to future actions caregivers plan to take also increased from baseline to PDSA cycle 3 regardless of year (table 2). Most caregivers (>88%) in both years planned to supervise their child within arms' reach. For life vest usage, CPR and swimming classes and four-sided fence protection, increases from baseline to PDSA 3 were between 5% and 15% (table 2).

Counselling rate and provision of materials: Our outcome measure, average counselling rate, increased from 26.8% during baseline to 64.9% at the end of PDSA

3. Percentages increased over time and there was special cause variation starting with the transition from PDSA 1–2, demonstrating eight points above the centre line by the end of PDSA 2. The overall increasing trend continued through PDSA 3, and the process shift was demonstrated with a recalculated centre line at 36.7% (baseline and PDSA 1) to 60.3% (PDSA 2 and 3) (figure 1). Correlation between week and percent counselled is high ($R=0.92$) (results not shown). We also closed an existing gap through provision of drowning prevention materials. Caregiver receipt of drowning prevention brochure at baseline was 22.3% (2022) and 15.2% (2023) which increased to 98.4% (2022) and 98.9% (2023) after PDSA 3. For water watcher tags, receipt also increased significantly from baseline 6.9% (2022) and 6.6% (2023) up to 91.7% (2022) and 95.2% (2023) by the end of PDSA 3 (table 1). Assessing our balancing measure, the median percentage of physicians who were able to counsel in 2min or less increased from 2022 (69.3%) to 2023 (82.1%) (p value<0.001) (results not shown). On post-course evaluations in 2023, 98.3% of participating physicians stated they would continue water safety counselling in their practice (results not shown).

Contextual observations: We identified a contextual element interacting with our intervention, as we learnt through webinars that some physicians handed out caregiver surveys after counselling, but prior to giving materials at the end of the visit. We identified ways for

paediatricians to revise their process and use materials during counselling so caregivers could more accurately affirm receipt of materials on their surveys. This element was carried forward to future programme cohorts to optimise counselling and tracking of the provision of drowning prevention materials.

Continuation of the COVID-19 pandemic-related challenges in 2022 with low patient volumes in paediatric practices had an unexpected benefit of spreading our intervention into community settings such as health fairs and other events, church gatherings and swim programmes, where paediatricians counselled and surveyed caregivers to meet the requirements of the MOC programme. This unexpected outcome was so well received by the participants' communities based on comments provided in the postcourse evaluations, that we intentionally incorporated community spread in 2023 as a suggested focus towards the end of PDSA 3 to transition into sustainability and spread phases after programme completion.

LESSONS AND LIMITATIONS

Across both years of participants, the biggest barrier to implementation of the drowning prevention counselling has consistently been time available during a clinical encounter. We also found that the initial time commitment and effort on the part of the participating physician

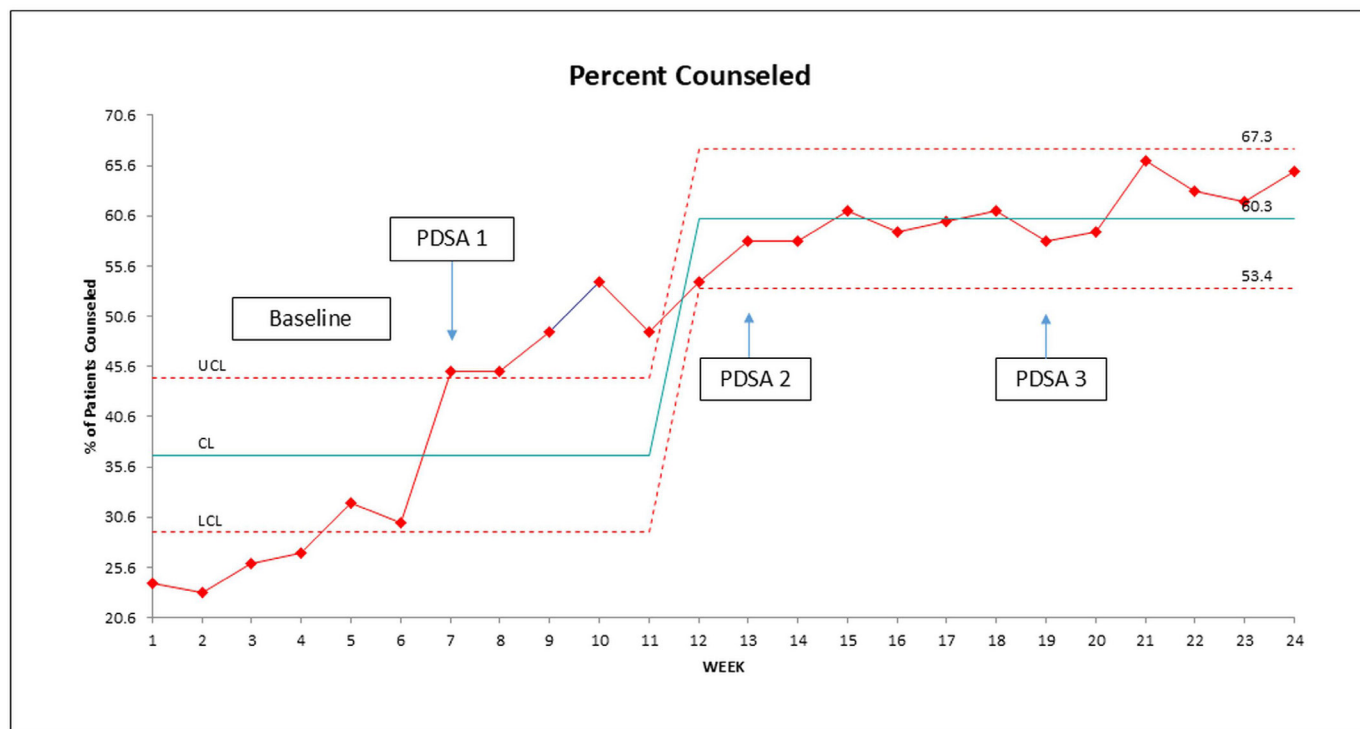


Figure 1 Control chart showing percentage of patients counselled weekly on drowning prevention (see separate file uploaded with figure). Our outcome measure, average counselling rate, increased from 26.8% during baseline to 64.9% at the end of PDSA 3. Mean counselling rate improved from 26.8% to 49.4% during PDSA 1, 59.5% in PDSA 2 and finally 64.9% at completion of PDSA 3. Special cause variation signifying the process shift was demonstrated with a recalculated centre line at 36.7% (baseline and PDSA 1) to 60.3% (PDSA 2 and 3). PDSA, Plan Do Study Act. CL, Control Limit; LCL, Lower Control Limit; UCL, Upper Control Limit.

to develop a workflow or process with their clinical staff was another challenge.

There are some limitations to our QI initiative. Our main intervention was educational, which is known to be a weaker change strategy. However, we felt this was an important initiative to undertake, given insight programme leaders received from families who had lost a child to drowning that they had never heard about drowning prevention from their paediatricians, likely due to the multitude of topics paediatricians need to cover during a well visit. We sought to mitigate the limitations of an educational intervention by pairing it with the provision of educational materials including water watcher tags for families to take home.

Additional limitations include the possibility of social desirability bias, as physicians may be more inclined to demonstrate the programme's usefulness especially in relation to their own maintenance of board certification.¹⁷ There is also a high potential for physician and caregiver bias in self-reporting data, as they may wish for results to reflect favourably, and counselling occurred during time-limited settings.¹⁷ While both caregivers and paediatricians endorsed a high likelihood of anticipated behaviour change, our programme did not include long-term follow-up to determine whether the changes were implemented. Due to the programme occurring in multiple cities and states, alongside local drowning prevention efforts external to the programme, we were unable to assess the effectiveness of the programme in reduction in drownings, which would be the ultimate patient-centred outcome.

To inform a process of continuous improvement, we obtained programme evaluation surveys from all participants, which were a required component for MOC credit, therefore ensuring a 100% response rate. While there were no significant differences found between 2022 and 2023, the programme scored highly on Likert scales for both years. We also requested qualitative feedback from participants on strengths and opportunities for the programme. The main strengths identified by participants included being a well-organised, informational and meaningful activity, high quality of drowning prevention education and expertise provided, effective and relevant counselling strategies, engaging and well-received materials for families, especially water watcher tags, interactive webinar discussions to share physicians' ideas and experiences and acquiring valuable QI tools to implement lasting change in their practice. One illustrative quote from a participant stated (the best thing about the entire MOC programme was the 'high level of receptiveness and feeling that counseling and information would be used and even spread beyond the clinic, ultimately, I believe this will save someone's life'). Additional benefits from the MOC programme included some participants who expanded the intervention in individualised ways such as creating a local water safety booklet with phone numbers for certified aquatic facilities in the area offering water competency lessons and licensed semiprivate instructors for families.

Opportunities for improvement were reviewed and discussed among programme leaders to identify changes that could be incorporated for subsequent cohorts. Through COVID-19 pandemic-related challenges and participant feedback in 2022, we sought creative ways for participants to counsel during virtual visits and spread drowning prevention education into the community. We also gained valuable insights on collaborating with paediatricians across multiple time zones to incorporate flexibility into webinar timing and provide a recorded option with associated quiz.

Sustainability of the intervention within individual clinical practices largely depends on the limiting factor of drowning prevention materials. Financial limitations affected the number of educational materials participants were provided. Resources for additional families (outside of the 60 caregivers surveyed) could have further impacted the counselling rate. The high degree of anticipated practice change expressed by participants across both years speaks to the likelihood of sustainability; however, it will be impacted by material availability. We sought to overcome this by inviting outside speakers who provided practical resources including a downloadable paediatrician toolkit from the National Drowning Prevention Alliance that practices could print and disseminate to patients during future counselling.

CONCLUSION

Drowning is a leading cause of preventable death among young children. In our national QI/MOC programme, we demonstrated that drowning prevention counselling rate with provision of educational materials can be increased by implementing focused counselling during paediatrician visits. The materials, especially wearable water watcher tags to promote supervision, closed an existing gap and were well received by families. We improved measures including counselling rate and counselling time across three PDSA cycles during 2022 and 2023. While we did not achieve our SMART aim of 75% counselling rate, we recognise this was a lofty goal and did demonstrate significant improvement throughout the programme by more than doubling the baseline rate. This was achieved without adverse effect, actually improving our balancing measure of time needed to deliver drowning prevention counselling. Caregivers expressed a very high degree of anticipated behaviour change following the counselling. These findings, along with nearly all participating physicians stating they would make a practice change to continue water safety counselling (and provision of materials), highlight the success of this programme.

Sustainability of the counselling intervention will be limited by available resources, and participants were provided access to a downloadable toolkit with printable materials to support future counselling efforts. The QI/MOC programme approach we used has the potential to be replicated and applied to other injury prevention counselling topics important to paediatricians. Future

directions of the programme include development of an asynchronous module format to promote sustainability and spread to more paediatricians nationally, and consideration of follow-up surveys of participating paediatricians as well as caregivers to assess for actual behaviour change related to drowning prevention strategies.

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Contributors TM and SY conceptualised and designed the QI and MOC programme methodology, and SY oversees programme administration. TM, ARA and SY were involved in the development of resources, supervision and validation of the programme. TM wrote most of the manuscript first draft, with some sections written by ARA and SY. EC designed and performed statistical analyses, designed the tables and figures and wrote the results section of the manuscript. TM incorporated coauthor edits and revised the manuscript final draft. All authors contributed to the interpretation of data. All authors reviewed the manuscript critically for important intellectual content, approved the final version to be published and agreed to be accountable for all aspects of the work. The authors declare use of AI for revision of the manuscript, specifically the 'strategy section of the manuscript to break each PDSA down into Plan, Do, Study and Act components to more clearly explain the PDSA cycles'. The reason for the use of this technology was to create an outline and rewording of this portion as the manuscript was already approaching word limit. ChatGPT suggestions were then reviewed, revised and further pared down to explain each portion of the cycles clearly yet succinctly. The input and output for ChatGPT has been included as a supplemental file. TM is the guarantor.

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Patient and public involvement Patients or the public were not involved in the design, reporting or dissemination plans of this initiative. Caregiver survey responses following physician counselling were used to inform future PDSA cycles.

Patient consent for publication Not applicable.

Ethics approval We applied to the Baylor College of Medicine Institutional Review Board (IRB) prior to the start of this programme to evaluate patient risk, benefits and ethical considerations. The IRB determined that individual patient data was not being collected and the study met the criterion for IRB exemption. Study ID was not applicable since no study ID was assigned by the IRB, and a letter of exemption was provided.

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