

A Water Safety Education Program for Primary Care Providers

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## Abstract

**Project Title:** A Water Safety Education Program for Primary Care Providers

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**Purpose/Aims:** We aim to increase understanding of water safety measures among primary care providers and improve the quality and efficiency of parent water-safety education.

**Background and Significance:** Drownings are the leading cause of death in one to four year old children in the United States. Arizona's drowning rate is nearly double the national average for this age group. Water safety is an important anticipatory guidance topic a primary care provider should be discussing at all well visits. The Health Belief Model is an effective framework to guide family education interventions. It is strongly encouraged that providers incorporate water safety education into the developmental milestone discussions.

**Methods:** Ten providers recruited from six Arizona pediatric primary care clinics participated in an educational one-hour session. Providers were encouraged to prioritize water safety discussions within the one to four year old age group and deliver education in the context of individual child development. Additionally, providers were updated on water safety recommendations from the Center for Family Health and Safety at Phoenix Children's Hospital. Supplemental handouts with developmental water safety information were given to each office to aid providers in parent education. A pre-survey was administered to the providers prior to the

education session and a post-survey was given at an eight-week follow up. The surveys measured provider perception and current practices of water safety education and utilized a Likert scale to compare data sets. Current and retrospective chart reviews were conducted to evaluate sustainability of the educational intervention.

**Outcomes/Results:** Sixty percent of provider participants were Medical Doctors (MD) and 40% were Nurse Practitioners (NP) with experience ranging from one year to over 20 years.

Following the education session, providers were more likely to discuss keeping a child at arms-reach at all times ( $p=0.046$ ) during their well visits. There was also an increase in providers incorporating water safety discussions into milestone education ( $p=0.054$ ).

**Conclusion:** This educational intervention empowered providers to deliver water safety education in the context of normal developmental milestones at each one to four year old well visit. The anticipatory guidance emphasizes to parents that the behaviors their children exhibit are healthy and normal, but also explains how achieving these milestones put their children at greater risk for drownings. This quality improvement project is part of a larger initiative to decrease the number of drownings in Arizona through education and policy.

*Keywords:* drowning, drowning prevention, primary care, anticipatory guidance, tailored anticipatory guidance.

## A Water Safety Education Program for Primary Care Providers

Drowning is a devastating and complex issue impacted by both physical and social determinants of health. Nationally, as well as in the state of Arizona, drownings are the leading cause of death in children ages one to four years old (Centers for Disease Control and Prevention [CDC], 2016). These deaths are considered preventable, as measures can be taken to change the circumstances leading to drowning (Arizona Department of Health Services [ADHS], 2018). Primary care providers (PCP) are a hub of health and safety information for most families. As such, supporting their efforts to educate parents on drowning prevention behaviors is a critical part in decreasing risk in toddlers.

### **Problem Statement**

The national average unintentional drowning rates from 2001- 2016, ages zero to four years of age per 100,000, is 2.43. Arizona's rate is nearly double that at 4.58 per 100,000 (CDC, 2016). Both nationally and in the state of Arizona, boys are twice as likely to drown as girls (ADHS, 2017; CDC, 2016; World Health Organization [WHO], 2018). Swimming pools, followed by natural water ways, are the primary place for drownings to occur (ADHS, 2017; CDC, 2016). While there is adequate evidence on the usefulness of barriers and approved flotation devices, the only true protection against drowning is constant capable supervision (Isaacson, 2017).

Swimming lessons for children have long been sought out by parents as a method of protection from drowning. It has been determined that swimming lessons do not increase the likelihood of drownings for toddlers, however, they are inadequate for decreasing drowning due to developmental limitations associated within this age group (American Academy of Pediatrics

[AAP], 2010). Conveying this information to parents in an effective manner still remains a challenge.

Primary care providers are important source for parent education. Like so many others, the topic of drowning prevention has been added to the list of anticipatory guidance (AG) topics a provider should discuss with families at well-visits. It is well known that the list of topics recommended to be covered in a well-visit is ever increasing, and the barrier of time is ever present (Coker et al., 2013). Most providers are allotted an average of fifteen to twenty minutes for a health history, physical exam, and anticipatory guidance (Gittelman et al., 2015).

Literature is exhaustive in emphasizing the need to develop programs and tools that can provide anticipatory guidance, while decreasing the provider load (Coker et al., 2013). Amongst health history and comprehensive physical exams, injury prevention often falls by the wayside. It is important to support providers with evidence-based resources to ensure these critical topics do not get left out of the conversation.

### **Purpose and Rational**

It is the purpose of this evidence-based project to reinforce the importance of water safety AG, evaluate effective methods of implementation, and determine reasonable solutions to lend support to providers caring for toddlers who are at high risk for drowning.

The topic of drowning prevention was selected due to the alarmingly high rates of drownings among children one to four years of age. This is a preventable phenomenon that should be prioritized among primary care providers.

### **Background and significance**

#### **National and State wide Data**

CDC's (2017) national action plan for drowning consists of three goals: raise awareness, highlight prevention solutions, and mobilize action. According to the CDC, AAP, and ADHS, prevention of drowning requires a series of behaviors to be adapted. First and foremost, constant capable supervision by responsible adults should be emphasized as the most effective way to keep children safe; however, lapses in supervision are an unfortunate reality and it is important to build up layers of protection to enhance, not replace, supervision. Fencing around pools is thought to prevent up to 50% of drownings and is strongly recommended by all major drowning prevention advocates.

Supervising adults should know how to swim, rescue a child, perform Cardiopulmonary Resuscitation (CPR), and call 911 (AAP, 2010; CDC, 2017). While swim lessons are a popular focus for drowning prevention, it is noted by the AAP (2010) that lessons do not “drown-proof” children. Therefore, proper supervision, barriers, and CPR need to be an educational priority.

The AAP (2010) includes routine anticipatory guidance as a part of their recommendations to help identify and educate caregivers of children that are at high risk for drownings. The primary care setting plays an important part in prevention due to its focus on anticipatory guidance during child well-visits. Risk assessments focusing on cell phone use, chores, socializing, and drinking alcohol while children are swimming are important and often not covered (Isaacson, 2017). Evaluation of social health is an important part of the well-exam. According to Healthy People 2020, social determinates of health are “conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks” (Office of disease prevention and health promotion [ODPHP], 2018). Drowning is no exception to this.

**Internal Evidence**

A children's hospital in Arizona is seriously addressing the issue of social determinates of health in regards to drowning prevention. A workshop was conducted with a pre- and post-survey regarding prevention strategies with parents of children one to four years of age. Post workshop survey results revealed improvements in swim skill perception of children, risk assessment, isolation reduction, and social empowerment (Isaacson, 2017). This children's hospital is researching issues such as parental resilience, the role of poverty, culture, and language barriers as they pertain to drowning risk (Isaacson, 2017). However, once these issues are identified, the problem of information distribution and behavior change remains a barrier. Primary care providers remain a primary source of information for parents and much of the expectation to relay important health information falls to them.

**Role of Primary care**

Primary care providers need effective and time efficient strategies to address all important points of a well-visit in the limited time frame available to them. A review of anticipatory guidance for unintentional injury prevention, with a focus on water safety, revealed a multitude of supplemental education strategies that showed effectiveness in adapting parent beliefs and behavior.

A study conducted by Cheraghi and colleagues (2014) suggested that education based on the Human Behavior model improved knowledge, attitudes and practices of mothers who had children under five years of age. These women are located in Iran and considered to be of low educational levels. The authors reported that visualization of injury severity using booklets and visual teaching aids were most effective in changing the participant's attitudes toward injuries of children. Using booklets, visual media and other resources that may enhance knowledge outside

of face-to-face time with a provider is desirable due to limited time during office visits. A study evaluating web-based safety education for parents, conducted by Van Beelen and colleagues (2014), showed significant changes in safety behaviors in regards to home hazards, including bathing of children. Prior to Van Beelen, Christakis and colleagues (2006) found that use of an evidenced based interactive website correlated with increased discussions on safety topics with physicians at well visits.

Closely examining anticipatory guidance and its role in providing health information to the public, the following PICO question is posed: For children ages one to four years of age, is multimodal anticipatory guidance, compared to traditional one-on-one visits with a provider, effective in increasing parent knowledge on injury prevention, specifically drowning, consequently decreasing provider burden?

### **Search Strategy**

Databases searched were CINAHL, PubMed, and PsycInfo (See Figure 1). Key words used were *unintentional injury, drowning, prevention, primary care, education, anticipatory guidance, children, child, infant* and *pediatrics*. Limits applied included literature within the past 5 years, clinical trials, and systematic reviews. Reference lists of studies deemed appropriate were also reviewed for applicable studies. PubMed offers a *similar article* search, which was utilized for acceptable articles as well. Narrowed searches were then deemed appropriate based on potential for practice change in a pediatric office, utilization of methods that would potentially decrease time needed with a provider, and investigation of effectiveness of anticipatory guidance methods for practices and providers. Search strategies can be found in Appendix B, C, and D.



PubMed (Appendix A) search combinations included Drowning OR Water safety AND Education OR anticipatory guidance. Limits of 5 years, clinical trial and review were added for a final yield of 84 studies which were reviewed for appropriateness with a final yield of 4 studies. Because drowning is often combined with other unintentional injury studies, a search for Child OR children OR infants AND unintentional injury was made, yielding 12,812 results, the limits of 5 years and clinical trials and reviews were added for a yield of 756 articles which were reviewed for relevance. The studies were reviewed for appropriateness and the final yield for critical appraisal was 18 studies.

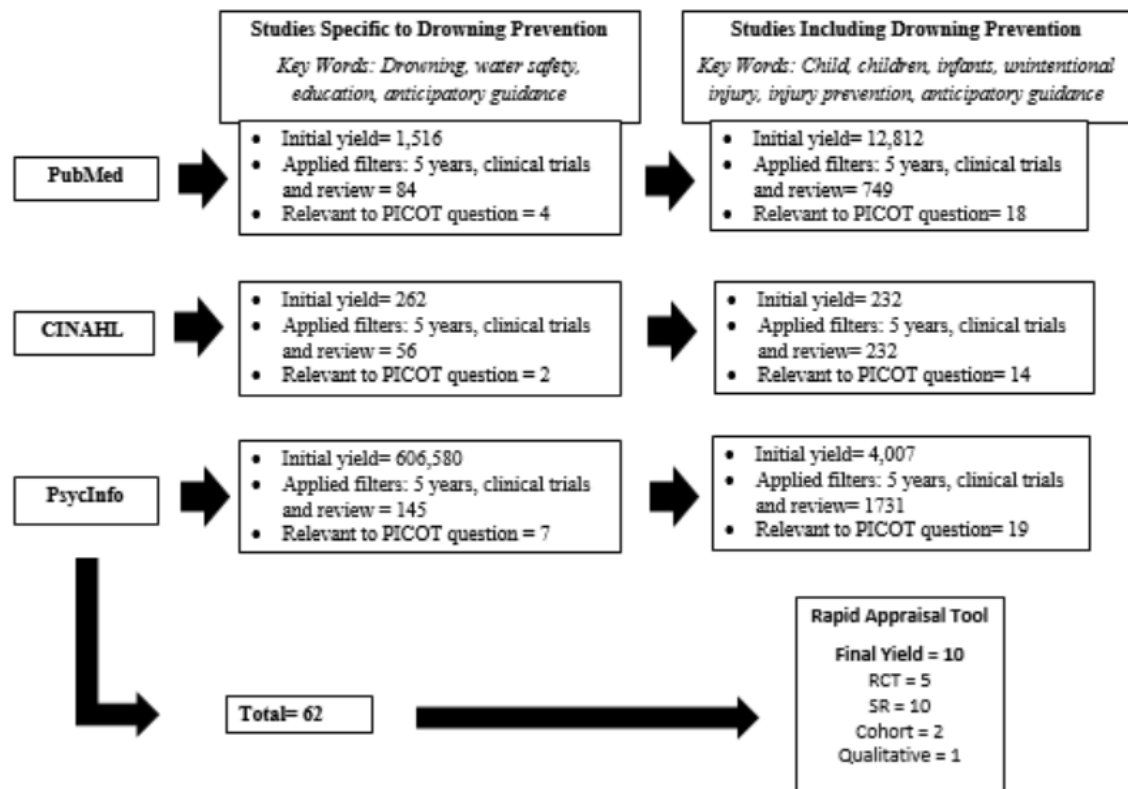


Figure 1. Database search strategy

The search in CINAHL (Appendix C) used combinations of search terms including Drowning OR Water safety AND Education OR anticipatory guidance. Initial yield was 262

articles. The limit of 5 years was placed a yield of 56. Articles were then reviewed for appropriateness and the final yield was two studies.

An additional search for Child OR children OR infants AND unintentional injury was made yielding 232 results. Articles were then reviewed for appropriateness and the final yield was 14 studies.

The search in PsycInfo (Appendix B) used combinations of search terms included including Drowning OR Water safety AND Education OR anticipatory guidance. Initial yield for this search was 606,508 articles. The limit of 5 years and academic journals yielded 145 articles, of which 7 were deemed appropriate for critical appraisal. An additional search for Child OR children OR infants AND unintentional injury was made yielding 4007 results. The limit of 5 years was placed resulting in a yield of 1731 articles of which 19 were appropriate for critical appraisal.

The remaining 64 studies were then reviewed using a rapid critical appraisal tool. This resulted in 10 high quality studies that were selected for appraisal and synthesis based on their relevance to the PICOT question and quality of evidence. The 10 studies selected were: two systematic reviews, five studies randomized control trials, two cohort studies, and one study was qualitative (Appendix D).

### **Critical Analysis and Synthesis of Evidence**

The 10 studies selected focused on anticipatory guidance pertaining to injury prevention. According to the United States Preventative Task Force, the evidence included levels I, II, and III studies. All studies included the target age of one to four years old. Seven of the studies were conducted in a primary care setting. (Appendix D).

Tailored anticipatory guidance (TAG) was a major theme found among the research studies (Appendix E). With the constant stream of new knowledge parents must filter and the existing environment of information overload, it is reasonable that the evidence suggests parents respond well to information that is tailored to their present needs. Six of the 10 studies addressed positive effects of TAG (Appendix D). Themes that emerged regarding outcomes consisted of a combination of time needed with a healthcare provider, parent knowledge, and quality of care (Appendix E). Most studies did not identify a framework, but the Health Belief Model (Hochbaum, Rosenstock & Kegels, 1988) and the Stetler model (Stetler, 2001) were feasible and applicable to guide the development of the intervention and plan the implementation of the project.

The methods used to assess and address the specific needs of families included a variation of technology-based interventions. Web based-platforms, including waiting room kiosks, made up the majority of the interventions reviewed. Other platforms such as group well visits, non-medical personal-delivered information, DVD, and a screening tool were included. In general, there is a relationship between TAG for parents and decreased time needed for provider visits. Utilization of alternate formats of AG showed an increase in quality overall (Appendix E). Findings showed an increase in topics covered, utilization of new technology by parents and practices, and positive behavior changes. In addition to technological interventions, a RCT evaluating effectiveness of the Health Belief Model on knowledge regarding injury prevention was included, had positive effects on parent knowledge and can potentially be used to guide implementation of new practices (Appendix D).

Due to the nature of the inquiry, a significant amount of data was heterogeneous. There was a variety of measurement tools used, mainly consisting of questionnaires, surveys, and data

reviews. These tools were appropriate, but there is an increased risk of bias associated with questionnaires and surveys limiting the quality of evidence. The majority of the studies relied on parent feedback and self-reported behaviors which also increased the risk for bias.

Eight of the 10 studies focused on parent outcomes specifically, and the remaining focused on practice or provider outcomes. However, in most studies, the dependent variables were similar, with overarching themes of quality improvement, parent/provider knowledge, and time spent with provider for AG education.

### **Conclusions from the evidence**

While there is little evidence to suggest that there is a platform more effective than one-on-one education between a provider and family, it is reasonable to conclude that various tools can enhance the patient experience and decrease the demand on the provider. Many practices do not have the time or resources to adequately educate every family on injury prevention. Therefore, it is practical to conclude that tailored anticipatory guidance has a very important place in preventative education.

Provider buy-in is an important component to these interventions, and reviewing evidence-based methods to increase incentives and reduce barriers would be beneficial for the implementation of TAG projects. Creating a tool that is cost effective and saves time will only be effective if the providers and staff believe them to be so. Likewise, TAG tools require parent cooperation and interaction, and developing techniques to administer the information most effectively is important to the success of any implementation.

### **Theoretical Framework and EBP Model to Guide Implementation**

The Health Belief Model (HBM) (Appendix F) explains and predicts preventive health behavior (Hochbaum, Rosenstock & Kegels, 1988). Concepts related to this model directly relate

to drowning prevention. The model's concepts focus on perception: perceived susceptibility, perceived severity, perceived benefit, perceived barriers, cues to action and self-efficacy (Glanz, Rimer & Viswanath, 2008). Drowning prevention behaviors such as supervision, use of barriers, and decrease of distractions, will be more effective if parents have a greater perception of risk. The HBM has shown to be an effective model for injury prevention (Cheraghi et al, 2014).

The evidence-based practice model (EBP) selected to guide practice is the Stetler model (Appendix G) (Stetler, 2001). The Stetler model is a practitioner oriented approach to EBP and was updated in 2001. It includes five phases: preparation, validation, comparative evaluation and decision making, translation/application, and evaluation (Stetler, 2001). The criteria of this model focuses on substantiating evidence, current practice, fit, and feasibility (Stetler, 2001). The Stetler model is a good fit for practice implementation and delineates a clear path for evidence based change.

### **Project Methods**

The evidence-based project developed, based on the literature review, was a water safety education program for PCPs. The institutional review board of Phoenix Children's Hospital and Arizona State University approved this project. This project includes a water safety presentation given at six Arizona primary care offices. Providers were recruited at the presentation and provided with a pre-survey to complete. The pre-survey was de-identified via a provider-selected 4-digit pin. By completing the survey, each provider agreed to implement new education strategies for water safety education with parents of children ages one to four years old during a well visit.

Four developmental handouts were created with TAG information for each separate age (1-4 years old). The handouts emphasized normal developmental milestones for each age, and

the risks advancing development poses around a pool. These handouts were developed to aid providers in the water safety discussion with parents, and offered parents further educational resources.

A PowerPoint presentation was created and printed for the education portion of the project and contained updated information for the provider on the efficiency and effectiveness of TAG. The information was verbally reviewed and enhanced by the educator and discussions were encouraged. The education content encouraged water safety discussion with parents in terms of their child's developmental milestones, and reviewed what it means to be a capable supervising adult at the pool (See Figure 2).

Chart audits were performed at the offices of the participating providers, assessing for any change in the amount of water safety education being provided to parents of patients one to four years of age, before and after the water safety education was presented to the providers. The audits looked at three months of charts one year prior to the education session, and three months of charts starting a month after the intervention. The chart audit form was developed by the project leaders and included the following data: type of provider, patient age, primary language, presence of water safety education charted before and after initiation of the project.



*Figure 2.* Key aspects of capable adult supervision.

Patient charts (n=450) were reviewed utilizing randomized sampling techniques: 226 were selected for the retrospective review and 224 charts were selected 1-3 months after the provider education was delivered. Every third well visit that fell within the 1-4 year old age group was reviewed. This process was repeated for each office. No office or provider was identified.

Primary care providers (n=10) agreed to participate and their agreement was confirmed by the completion of the pre-survey before the education session. It was made clear that the providers could decline to participate at any point during the project implementation. Eight providers participated in the post-survey eight weeks after the education session. The post-survey utilized Likert scale questions to evaluate for any change in provider perceptions and behavior.

### **Outcomes/Project Results/Impact**

Data was analyzed using IBM SPSS 25. Demographic data was evaluated using frequencies, and a Wilcoxon signed-rank test was used to compare pre- and post- survey answers for significant change. Chart data utilized the crosstab feature to assess for clinically significant changes in education. Sixty percent of provider participants were Medical Doctors (MD) and 40% were Nurse Practitioners (NP) with clinical experience from one year to over 20 years. No significant difference was found between the two types of providers in regards to amount of water safety education performed. The language the parent/patient spoke did not affect the amount of education provided. Following the education session, providers self-reported that they were more likely to discuss keeping a child at arms-reach at all times ( $M=1.88$ ,  $SD=.354$ ,  $p=0.046$ ) during their well visits. There was also an increase, but not significant increase, in providers incorporating water safety discussions into developmental milestone education ( $M=2.38$ ,  $SD=.916$ ,  $p=0.054$ ). Eighty percent of providers reported time constraints as a major

barrier to water safety education. All of the providers indicated on the pre-survey that they thought the patient handouts would be a useful addition to their practice. The follow-up post-survey evaluation indicated only 20% of providers reported using the handout *often or always* after the educational session (See Appendix H).

Chart audits revealed an increase of water safety education among one year olds from 67% to 93%. There was significantly less education documented in the subsequent age groups (See Figure 3). Additional chart review information can be found in Appendix I.

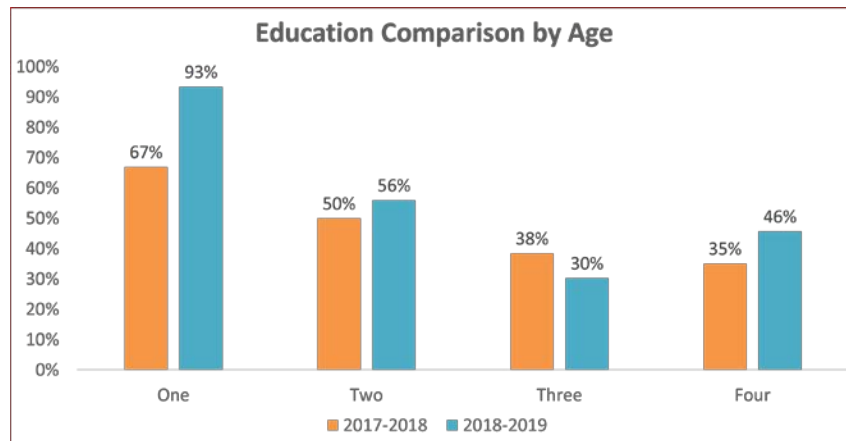
### **Discussion**

Due to the high incidence of fatal drownings in the 1-4 year old age group, water safety should be prioritized at well-child office visits. Since the start of this project, the American Academy of Pediatrics released an updated drowning prevention policy, reinforcing the necessity of quality supervision for this age group (AAP, 2019). The AAP (2019) also reinforces the need for targeted interventions, such as this one, for vulnerable populations.

This project adds supports to the body of literature that addresses the need for systematic change in regards to injury prevention education. In particular, the limited time providers are able to spend with patients during a well visit is a barrier to delivery of anticipatory guidance. Future projects and research should focus on strategies that address provider time constraints and the disparities between what anticipatory guidance education is expected and what is realistic to time limited office visits. The providers should also aim to increase pool access and safety screening in vulnerable populations in order to target education further for these populations. Further research is needed to determine whether discussing water safety with parents before their child is mobile is a more effective strategy than waiting until the child is one year old. Finally,



projects addressing the need to provide consistent, continuing education to parents of two, three, and four year olds may help increase parent awareness and safety practices.



*Figure 3.* Education comparison before and after education evaluation.

### **Conclusion**

The leading cause of death in children ages one to four years old is preventable, unintentional drownings. Parental education on necessary behaviors to safely supervise children around water is paramount to successful prevention. Primary care providers are expected to provide this information in a time-limited 15-20 minute office visit. This evidence-based project educated pediatric primary care providers on the risk and most current education strategies for this population. Results of the project demonstrated an increase in providers educating parents to keep their toddlers within arm's reach at the pool at all times. In addition provider water safety education for one year old children demonstrated a 26% increase following the brief educational intervention.

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## Appendix A

### Database Search Strategy

#### PsycInfo

<input type="checkbox"/> Set ▼	Search	Databases	Results	Actions
<input type="checkbox"/> S9	<input type="checkbox"/> (Child OR children OR infants) AND (Injury Prevention) AND (Anticipatory Guidance OR Prevention) ✓ Limits applied	PsycINFO	1,731*	Actions ▼
<input type="checkbox"/> S8	<input type="checkbox"/> (Child OR children OR infants) AND (Injury Prevention) AND Anticipatory Guidance ✓ Limits applied	PsycINFO	10*	Actions ▼
<input type="checkbox"/> S7	<input type="checkbox"/> (Child OR children OR infants) AND (Injury Prevention) ✓ Limits applied	PsycINFO	1,731*	Actions ▼
<input type="checkbox"/> S6	<input type="checkbox"/> (Child OR children OR infants) AND (Injury Prevention) ✓ Limits applied	PsycINFO	3,162*	Actions ▼
<input type="checkbox"/> S5	<input type="checkbox"/> (Child OR children OR infants) AND (Injury Prevention)	PsycINFO	4,007*	Actions ▼
<input type="checkbox"/> S4	<input type="checkbox"/> (Drowning OR water safety) AND (Education OR anticipatory guidance) ✓ Limits applied	56 databases	145*	Actions ▼
<input type="checkbox"/> S3	<input type="checkbox"/> (Drowning OR water safety) AND (Education OR anticipatory guidance) ✓ Limits applied	56 databases	38,528*	Actions ▼
<input type="checkbox"/> S2	<input type="checkbox"/> (Drowning OR water safety) AND (Education OR anticipatory guidance) ✓ Limits applied	56 databases	242,851*	Actions ▼
<input type="checkbox"/> S1	<input type="checkbox"/> (Drowning OR water safety) AND (Education OR anticipatory guidance)	56 databases	606,508*	Actions ▼

## Appendix B

### Database Search Strategy

#### PubMed




History

[Download history](#) [Clear history](#)

Search	Add to builder	Query	Items found	Time
<a href="#">#35</a>	<a href="#">Add</a>	Search ((Child OR Children OR infants)) AND Injury Prevention	<a href="#">12812</a>	00:15:35
<a href="#">#34</a>	<a href="#">Add</a>	Search ((Child OR Children OR infants)) AND Injury Prevention Filters: published in the last 5 years	<a href="#">3615</a>	00:15:32
<a href="#">#33</a>	<a href="#">Add</a>	Search ((Child OR Children OR infants)) AND Injury Prevention Filters: Review; published in the last 5 years	<a href="#">569</a>	00:15:32
<a href="#">#32</a>	<a href="#">Add</a>	Search ((Child OR Children OR infants)) AND Injury Prevention Filters: Clinical Trial; Review; published in the last 5 years	<a href="#">749</a>	00:15:22
<a href="#">#31</a>	<a href="#">Add</a>	Search (((Drowning OR water safety)) AND (Education OR anticipatory guidance)) Filters: Clinical Trial; Review; published in the last 5 years	<a href="#">84</a>	00:14:19
<a href="#">#30</a>	<a href="#">Add</a>	Search (((Drowning OR water safety)) AND (Education OR anticipatory guidance)) Filters: Clinical Trial; published in the last 5 years	<a href="#">18</a>	00:14:13
<a href="#">#29</a>	<a href="#">Add</a>	Search (((Drowning OR water safety)) AND (Education OR anticipatory guidance)) Filters: published in the last 5 years	<a href="#">756</a>	00:14:05
<a href="#">#28</a>	<a href="#">Add</a>	Search (((Drowning OR water safety)) AND (Education OR anticipatory guidance))	<a href="#">1516</a>	00:13:42

Appendix C  
Database Search Strategy

CINAHL

<input type="checkbox"/> Select / deselect all <span style="margin-left: 20px;"><b>Search with AND</b></span> <span style="margin-left: 20px;"><b>Search with OR</b></span> <span style="margin-left: 20px;"><b>Delete Searches</b></span> <span style="float: right;"><b>Refresh Search Results</b></span>			
Search ID#	Search Terms	Search Options	Actions
<input type="checkbox"/> S3	 ( Child OR children OR Infants ) AND Injury prevention AND ( Anticipatory guidance OR education )	Limiters - Published Date: 20120101-20181231 Search modes - Boolean/Phrase	<a href="#">View Results (232)</a> <a href="#">View Details</a> <a href="#">Edit</a>
<input type="checkbox"/> S2	 ( Drowning OR Water safety ) AND ( education OR anticipatory guidance )	Limiters - Published Date: 20120101-20181231 Search modes - Boolean/Phrase	<a href="#">View Results (56)</a> <a href="#">View Details</a> <a href="#">Edit</a>
<input type="checkbox"/> S1	 ( Drowning OR Water safety ) AND ( education OR anticipatory guidance )	Search modes - Boolean/Phrase	<a href="#">View Results (262)</a> <a href="#">View Details</a> <a href="#">Edit</a>



Appendix D  
Evaluation table

<i>Citation</i>	<i>Conceptual Framework</i>	<i>Design/ Purpose</i>	<i>Sample/ Setting</i>	<i>Major Variables</i>	<i>Measurement/ Instrument</i>	<i>Data analysis</i>	<i>Findings &amp; Themes</i>	<i>LOE/ Discussion</i>
Coker et al. (2013)  USA  Funding: none  Bias: Possible publication bias- negative intervention results are not included in peer reviewed literature.	Donabedian's Model	<b>Design:</b> SR  <b>Purpose:</b> Review interventions to change WCC delivery in PC setting for children 0-5 years of age.	N=33 n= 3751  Ages: 0-5 y  <b>Criteria:</b> - SR, RCT, NRCT, or OS. - WCC clinical practice redesign	AG delivery/ Utilization  Formats: - healthy steps - group WCC - non-face-to-face formats - additional providers - home WCC - preschool WCC	Downs and Black checklist  5 point Jdad score	PubMed (January 1981- February 2012)  Three investigators independently screened initial list to exclude irrelevant titles.	<b>Group WCC:</b> - ≥ 1:1 visits in effectiveness and efficiency - ↑WCC AG topics covered <b>Web based tools:</b> - ↓ Minor clinical concerns between well visits. - ↓ Time needed with provider <b>Non-medical professional providers for AG:</b> - ↑Parent knowledge and experience. - ↑ Time spent on AG topics - ↓Time needed with Provider.	Level I  Limitations: - Narrow SC - MA not possible due to heterogeneity  Conclusions: Alternative formats to deliver AG show promising results.

Note: **AG:** Anticipatory Guidance; **ED:** emergency department; **HBM:** health belief model; **HC:** health care; **HCP:** Health care provider; **IP:** injury prevention; **IPS:** Injury prevention specialist; **MA:** Medical assistant; **NRCT:** Non-randomized control trial; **OS:** observational study; **PARENT-** Parent-focused Redesign for encounter; **PC:** Parent Coach; **RCT:** Randomize control trial; **SR:** Systematic review; **ST:** Screening tool; **TAG:** tailored anticipatory guidance; **WCC:** Well Child Care; **WV:** well visit

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Coker et al. (2016)  USA  Funding: none  Bias: none	Donabedian's Model	<b>Design:</b> RCT  <b>Purpose:</b> Examine effectiveness of PARENT on quality and HC utilization among low income families.	N= 251  ages 0-3 y  English and Spanish speaking  Two participating pediatric practices  Intervention families remained in study for 12 month period and received PARENT intervention.	<b>IV:</b> PARENT program.  <b>DV1:</b> ED visits <b>DV2:</b> AG given <b>DV3:</b> Psychosocial assessment <b>DV4:</b> Family risks assessment <b>DV5:</b> Tobacco, Alcohol and drug assessment <b>DV6:</b> Family centered care <b>DV7:</b> Helpfulness of care	Parent Survey  Parent Questionnaire  Qualitative interview	Intention to treat analysis  <i>T</i> test  Pearson's $\chi^2$  Wilcoxon Rank sum test	↓ ED visits (p=.022) ↑ AG (p<.001) ↑ Health Information (p=.008) ↑ Psychosocial assessment (p<.001) ↑ Family risks assessment (p<.001) ↑ Tobacco, Alcohol and drug assessment (p=.007) ↑ Family centered care (p=.008) ↑ Helpfulness of care (p<.001)	Level I  Limitations: - Cost - Unable to report driving element of intervention effect.  Conclusions: When used in conjunction, a PC, web-based WV planner and automated AG text messages show positive results in ↑ parent knowledge and ↓ provider burden.

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Cheraghi et al. (2014)  Iran  Bias: Mothers only  Funding: Hamadan University of Medical Sciences	HBM	<b>Design:</b> RCT  <b>Purpose:</b> Assess health belief model on education of mothers for promoting safety and IP among mothers in Iran.	N= 120  ages 0-5 y  Educational programming based on HBM  Exclusions: congenital or chronic diseases.  Attrition rate: 0%	IV: HBM  <b>DV1:</b> Perceived sensitivity <b>DV2:</b> - Perceived severity <b>DV3:</b> - Perceived benefits <b>DV4:</b> - Perceived barriers <b>DV5:</b> - Cues to action <b>DV6:</b> - Self – efficacy	Pre and post Questionnaire	Students t test	All differences were statistically significant in favor of intervention group  p=0.001 for all dependent variables  ↑ Perceived sensitivity  ↑ Perceived severity  ↑ Perceived benefits  ↑ Perceived barriers  ↑ Cues to action  ↑ Self –efficacy	<b>Level I</b>  <b>Strengths:</b> A pilot study was previously conducted  Active participation of subjects  0% attrition rate  <b>Limitations:</b> Participants were mothers only  Data self-reported  <b>Conclusions:</b> Educational programming based on health belief model show significant efficacy and can be successfully implemented into IP education.

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Gittelman et al. (2014)  USA	Rosswurm and Larabee's Model	Design: RCT  Purpose: Determine if kiosk in pediatric ED can screen for injury risk and encourage safety changes at follow survey compared with IPS.	N= 317  ages 0-14 y  Pediatric ED  Kiosk ST grouped into tailored age groups.	IV: Kiosk ST  <b>DV1:</b> Responses to safety behavior questions.  <b>DV2:</b> Time to complete	- initial ED screening - completed follow up screen	Frequencies  X <sup>2</sup> analysis  Students <i>t</i> test	↓ Kiosk less effective in all age groups.  Overall p>.0001  ↓ Time to complete screen and education in kiosk group.  p<.0001	<b>Level I</b>  <b>Strengths:</b> Evaluates a time limited, busy environment.  <b>Limitations:</b> Kiosk group appeared to practice safer behaviors at initial screen.  Self-reported behavior  <b>Conclusions</b> Kiosk in ED can be appropriate for screening families due to short amount of time it takes, but should not be used as a stand-alone intervention for behavioral changes.

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Gittelman et al. (2015) USA Bias: none reported. Financial: Supported financially by Ohio Department of Public service-EMS injury prevention research grant.	Stetler Model	Design: Cohort study  Purpose: ↑ injury AG topics covered in well visits by offering screening tools and focused talking points to physicians.	N=720  Children < 1 year (2, 6, 9, & 12 months)  Pediatric Practices  Age specific tailored ST (6)	IV: ST  <b>DV1:</b> Percentage of providers using ST. <b>DV2:</b> Age appropriate IP AG topics covered at each WCV.	Random sampling of charts (Data review)	Frequencies  Measures table	↑ ST use in 3 months (97%)  ↑ IP discussion (>88% for each age group) <i>Greatest with water safety discussion (10.8%-95.7%)</i>	<b>Level II-2</b>  <b>Strengths:</b> Effective monthly collaborative calls. <b>Limitations:</b> -Sample charts used for evaluation -Physicians received incentive -Behavior changes not assessed.  <b>Conclusions:</b> Injury ST can be incorporated into PC office visits on a consistent basis. Tailored information allows the provider more time to address relevant concerns.

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Brixy et al. (2014)  USA  Financial: none  Bias: none	Social Cognitive theory	<p><b>Design:</b> Cohort study</p> <p><b>Purpose:</b> Describe pilot using technology to facilitate IP risk assessment and education integration.</p>	N= 2091  ages 0-4 y  Downtown Health Center Pediatric Clinic  Kiosk- <i>Safe N' Sound Program</i>  English only  Tailored safety assessments	<p><b>IV:</b> Kiosk</p> <p><b>DV1:</b> Injuries risks screening.</p> <p><b>DV2:</b> -Injury occurrence</p>	Monthly data review: Kiosks & injury and administrative data.	Descriptive statistics analysis  Fisher's exact test  Injuries identified were compared with injury areas addressed in Safe N' Sound report.	- 0-6 months 38% of all screenings - 4 years 5% of all screenings - 0.8% of screened children for injury required an injury related visit.	<p><b>Level II-2</b></p> <p><b>Strengths:</b> First effective evaluation of injury outcome associated with prevention program in clinic setting.</p> <p><b>Limitations:</b> Low participation of children 4 years of age.</p> <p><b>Discussion:</b> No child received an injury that he/she was screened for, which may indicate the screening is effective in what it covers, or that the screening is not effective at identifying risk. Further research is needed to determine.</p>

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<p>Van Beelen et al. (2014)</p> <p>Country: Netherlands</p> <p>Funding: Grant from ZonMw, the Netherlands organization for health research and development.</p> <p>Bias: none listed</p>	<p>Protection-Motivation theory</p>	<p>Design: <i>RCT</i></p> <p>Purpose: Tailored safety advice (E-health4Uth) compared to generic counseling leaflets.</p>	<p>N=1383</p> <p>ages 0-4 y</p> <p>Setting: Youth health care organization (5) and well-baby clinical offices (30).</p> <p>Attrition: 6.6%</p>	<p>IV: E-health4Uth</p> <p><b>DV1:</b> - Parent's child safety behaviors</p> <p><b>DV2</b> - Parent evaluation of E-health4Uth.</p> <p><b>DV3</b> - Parent and HCP evaluation of WV.</p>	<p>Pre and Post questionnaires</p> <p>Parent evaluation after E-health modules complete. (intervention)</p> <p>Parent evaluation of well child visit discussing tailored safety advice.</p>	<p>Logistic regression analysis and linear regression (evaluate E-health4Uth: CI-95%)</p>	<p><b>Drowning Specific knowledge:</b></p> <p>↑Bathing (p=.001)</p> <p>↑Pond (p=.82)</p> <p>↑Swimming pool (p=.14)</p> <p>↑Swimming (p=.87)</p>	<p><b>Level I Strengths:</b> Focuses on tailored intervention.</p> <p><b>Limitations:</b> -Drop-out rate highest among low income mothers. -Not tested on mobile platforms. -Possible recall bias to vouchers received. -Safety behaviors self-reported.</p> <p><b>Conclusions:</b> E-health4Uth is effective in promoting some safety behaviors. Overall web-based tailored advice is supported by the results of this study as an acceptable way to deliver unintentional injury advice.</p>

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Franz et al. (2014)  USA  No conflict of interest No funding  No bias reported	Stetler model	<b>Design:</b> RCT  <b>Purpose:</b> determine effectiveness of a 5 minute DVD as an educational tool used for AG.	N= 84  4 month WV  Community based pediatric clinic  English speaking  Exclusions: - Non English speaking. - Not child's primary caregiver - Ill child	<b>IV:</b> DVD  <b>DV1:</b> Knowledge scores <b>DV2:</b> Time with provider	Two page Pre and Post questionnaire survey based on bright futures recommendations for 4 month WV.  <i>Topics included: feeding, safety, sleep and family life.</i>	Descriptive statistics  ANOVA used to test hypothesis  Independent t sample conducted on visit length.	↑ Knowledge score pretest to post test. (p<.001)  ↓ time spent with provider (p < .02)  <i>No significant increase in knowledge compared to standard AG.</i>	Level I  <b>Strengths:</b> Explores time saving technique for AG. Lends support to existing literature that technology can be effective and time saving.  <b>Limitations:</b> Well educated Participates only.  Possible environmental cues to participants by leaving TVs in exam room.  <b>Conclusion:</b> DVD AG appear to shorten visit time with physician.

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<p>Tse et al. (2014)</p> <p>USA</p> <p>Bias: none reported</p> <p>Funding: intramural research program of the Eunice Kennedy Shriver National institute of child health and human development.</p>	<p>Consolidated Framework for Implemented Research</p>	<p>Design: Qualitative</p> <p>Purpose: Assess implementation of Safe N’ Sound kiosk using interviews and focus groups.</p>	<p>N=5</p> <p>Ages: 0-4</p> <p>Pediatric clinics in North Carolina</p>	<p>Facilitators and barriers to implementing kiosks.</p>	<p>Provider focus group</p> <p>Office manager interviews</p> <p>Waiting room observations</p>	<p>Coded scheme for main themes of interviews</p>	<p><b>Facilitators:</b></p> <ul style="list-style-type: none"> <li>- personalization and visual appeal</li> <li>- materials accessible to parents</li> <li>- agreement of staff with Safe N’ Sound information</li> </ul> <p><b>Barriers:</b></p> <ul style="list-style-type: none"> <li>- insufficient incentive</li> <li>- time and effort required to implement</li> <li>- lack of organizational leadership</li> <li>- competing parent demands</li> <li>- format did not match patient flow</li> </ul>	<p>Level III</p> <p><b>Strengths:</b></p> <p>Discusses perceived barriers to implementation from staff.</p> <p><b>Limitations:</b></p> <p>No day to day leadership</p> <p>Providers did not want to increase staff demand</p> <p>SNS is not a billable service</p> <p><b>Conclusion:</b></p> <p>Program implementation can be sustained by adapting to organizational needs and desires.</p>

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Omaki et al. (2015)	Donabedian's Model	Design: SR  Purpose: Identify technology based behavior changes evaluated in terms of unintentional injury.  Only studies reporting results were included	N=44  7- target parents of children  Ages 1-44 y  Inclusion: Education and behavior change evaluations with intervention and/or control was delivered by computer processor or mobile device. Observed or self-reported safety behaviors.	Technology utilization for UI prevention.	Checklist designed for RCT and NRCTs assessing: 1. external validity 2, internal validity 3. power of study	PubMed, Psychoinfo, Cochrane, EMBASE, SCOPUS, and Academic Search Complete.  Data abstraction form  Studies descriptively analyzed.  Checklist assessing quality of reporting, external validity, internal validity, power of study.	<b>Parent specific education:</b> - 4/7 + kiosk programs - 3/7 Software/internet programs - 7/7 + behavioral impact. - 2/7 + knowledge impact.	Level 1  <b>Strengths:</b> Provide information on usefulness of computer based injury prevention programs.  <b>Limitations:</b> No Meta-analysis performed  <b>Discussion:</b> Injury prevention behaviors can be modified with the assistance of computer based prevention.

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Appendix E  
Synthesis Table

<i>Author</i>	Coker	Coker	Cheraghi	Gittel- man	Gittel- man	Brixy	Van Beelen	Franz	Tse	Omaki
<i>Year</i>	2013	2016	2014	2014	2015	2014	2014	2014	2014	2015
<i>Design</i>	SR	RCT	RCT	RCT	CS	CS	RCT	RCT	Q	SR
<i>LOE<sup>†</sup></i>	I	I	I	I	II-2	II-2	I	I	III	I
<i>n=</i>	--	251	120	317	720	2091	1383	84	--	
<i>N=</i>	33	--	--	--	--	--	--	--	5	44
<i>Ages</i>	0-5 y	0-3 y	0-5 y	0-14y	<1y	0-4	0-4	4 m	0-4y	1-44y
<i>Interventions</i>	GWV WBI NMP	PARENT	HBM	K	ST	K	WBI	DVD	K	WBI
TAG		X		X	X	X	X		X	
GAG	X		X					X		X
<i>Outcomes</i>										
Time*	↓	↓	--	↓	--	--	--	↓	--	--
Knowledge**	↑	↑	↑	--	--	--	--	NC	--	↑
Quality***	↑	↑	--	↓	↑	↑	↑	↑	--	↑
<i>Setting</i>										
PC	X	X	--		X	X	X	X	X	--
ED			--	X						--
<i>M/I</i>	CL JDAD score	SV QTN INT	SV QTN	SC	DR	DR	QTN	QTN	FG INT OBS	CL

Note. **CL**-Checklist; **DR**-Data Review **DVD**- Digital video disk; **ED**-Emergency Department; **FG**- Focus Group **GAG**- General anticipatory guidance; **HBM**- Health belief model; **INT**-Interview; **K**- Kiosk; **LOE**- Level of evidence; **M/I**- Measurement/Instrument; **NC**-No change; **NMP**- Non-medical Professional; **OBS**-observation; **PARENT**- Parent-focused Redesign for encounter, Newborns to toddlers; **PC**- Primary Care; **Q**-Qualitative; **QTN**-questionnaire; **RCT**- Randomized control trial; **SC**-screening **SR**- Systematic review;; **SV**-Survey **TAG**- Tailored anticipatory guidance; **WBI**- Web based intervention

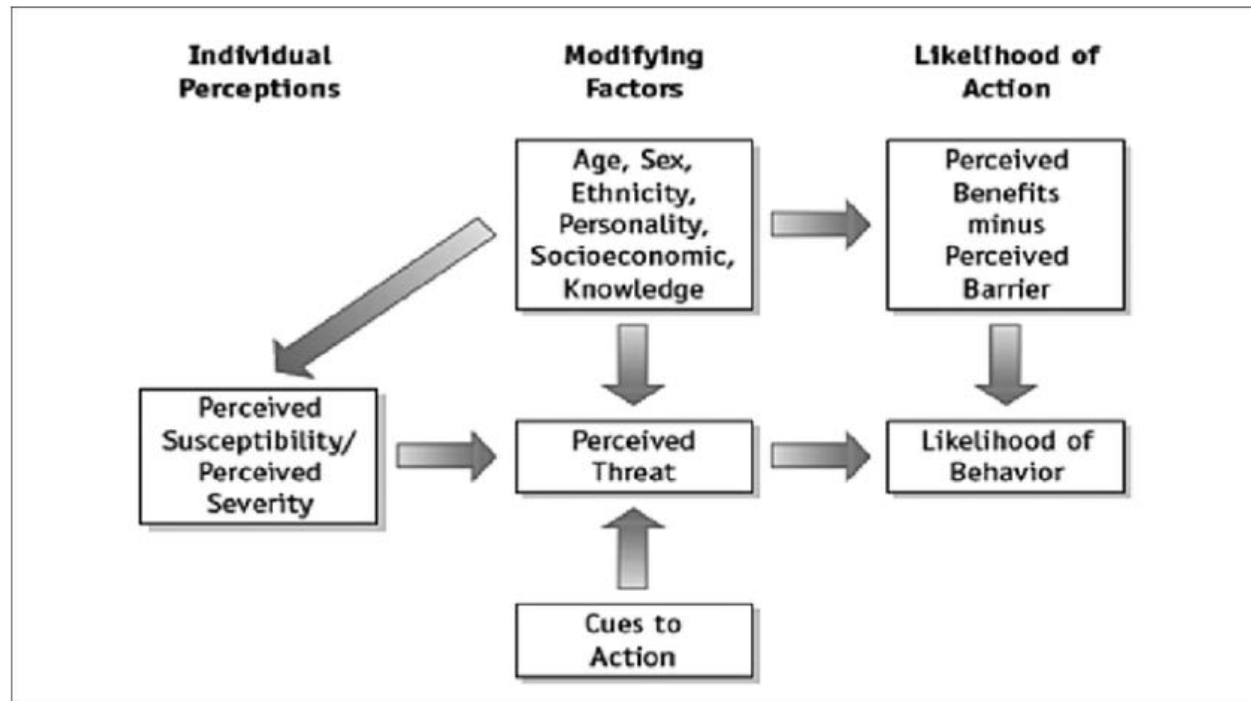
\*Quality = increased AG topics covered, utilization, practice change or behavioral change.

\*\*Time= Time needed with provider

\*\*\*Knowledge= parent knowledge

†LOE based on United states preventive serves task force

Appendix F  
Health Belief Model



(Glanz et al., 2008)

Appendix G

Stetler Model

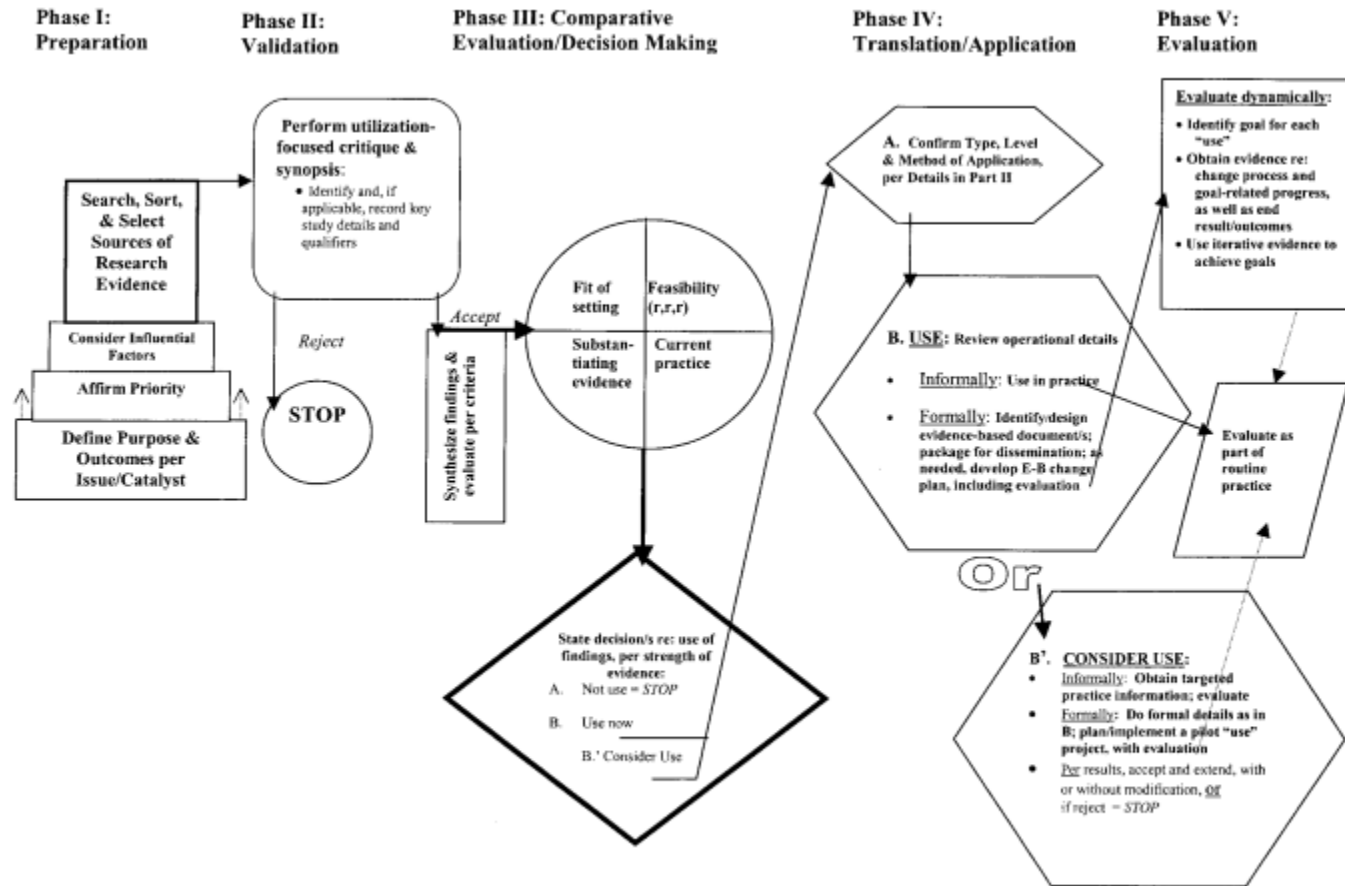


Figure 3A. Stetler Model, Part I: Steps of research utilization to facilitate EBP.

(Stetler, 2001)

## Appendix H

## Pre and post Survey Data

<b>Pre and post Survey Data - Wilcoxon sign paired test Comparison (5 Point Likert Scale)</b>	<b>p Value</b>
1. How often do you offer water safety education during your well visits?	= 1.000
2. Do you discuss the need for constant, capable supervision around the pool?	= .317
3. Water safety topics you routinely discuss	
• The presence of a supervising adult knowing how to swim	= .157
• The presence of a supervising adult trained in CPR and calling 911	= .317
• Keeping child within arm's reach at all time	= <b>.046</b>
• Having no more than one alcoholic beverage while supervising children at the pool	= 1.000
• No cell phone use (calls, texts, or videos) while supervising children	= .317
• Rotate capable pool supervisor every 15-20 minutes to avoid fatigue	= .157
• Do not go to the pool tired	= .564
• None of the above	= .1.000
<b>4. Do you incorporate water safety education into review of developmental milestones with families?</b>	= <b>.054</b>
5. What barriers are present in your practice that keep you from discussing water safety topics	
• Time constraints	= 1.000
• Uncomfortable providing education on this topic due to limited knowledge	= 1.000
• Difficulty remembering to incorporating swim safety into parent education for this age group	= .317
• Parents are not willing to discuss	= .564
6. Does the provision of a developmentally appropriate water safety parent handout assist you in remembering to discuss this topic by providing a visual cue	= 1.000
7. Do you feel that the water safety handout with information for parents about how to keep their child safe at the pool is a valuable addition to your practice	= .102
8. Is language ever a barrier when it comes to educating your patients?	= 1.000

Appendix I  
Chart Review Data

<b>Age of Patient</b>	<b>Count</b>	<b>Percent</b>
One	n=212	47%
Two	n=94	20.9%
Three	n=72	16%
Four	n=72	16%
<b>Gender of Patient</b>		
Male	n=228	50.7%
Female	n=222	49.3%
<b>Provider Type</b>		
Medical Doctor	n=299	66.4%
Nurse Practitioners	n=151	33.6%
<b>Language of Patient</b>		
English	n=377	83.6%
Spanish	n=68	15.1%
Other	n=5	1.1%
<b>Charted DP education</b>		
Reviewed	n=274	60.8%
Not reviewed	n=176	39%