

Improving Provider Compliance with Glycemic Guidelines

in Children with Type 1 Diabetes

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Abstract

The serum glycosylated hemoglobin or hemoglobin A1c (HbA1c) measurement is the most important long-term measurement of glycemic control and treatment effect when caring for the child with Type 1 diabetes mellitus (T1DM). The goal of treatment in diabetes is to maintain the patient's blood glucose within a specific therapeutic range. A team of specialized providers is typically responsible for the care of these children, and continuity of the treatment among providers has been shown to improve glycemic control. Additionally, provision of guideline driven care has been shown to have positive outcomes in terms of therapeutic HbA1c measurement. In January 2015, The American Diabetes Association (ADA) released revised HbA1c guidelines for children with T1DM. Their recommendation was all children with T1DM should have an HbA1c level of < 7.5%.

The goal of this quality improvement (QI) project was to promote and measure the level of provider compliance with current (2015) ADA glycemic guidelines using a standardized phrase for documentation in the electronic medical record (EMR).

Methods: There were three phases to the implementation of the project. The initial phase was the completion of an EMR audit to assess the current HbA1c measurements of the pediatric patients in the clinic. The second phase was performance of a survey to assess provider knowledge of current ADA guidelines and the third phase was the creation and implementation of a "smart phrase" for EMR documentation, which confirmed that the HbA1c measurement and the recommendations of the ADA had been addressed with the patient and family. At the completion of the intervention phase, the project leader performed a manual retrospective chart review, which provided the nominal data needed to measure provider compliance in the use of the EMR smart phrase.

Results: The project took place in a Diabetes and Endocrinology Center of a large urban academic medical center. The convenience sample of providers consisted of 9 pediatric diabetes care providers who currently practice at the center: three pediatric endocrinologists, three pediatric nurse practitioners and three certified diabetes educators. Data collection for the project was conducted over a six-week period, capturing 122 patient visits. Overall there was a 59% provider compliance rate with smart phrase usage; the group most compliant in smart phrase usage was the group of APRN providers, who used the phrase in 70% of patient visits.

Conclusions: The standardized EMR phrase was helpful in identifying provider compliance with discussing current ADA guidelines when utilized. Consistent use of the smart phrase reflects guideline-driven care by diabetes providers and sends a clear message to families of patients with T1DM regarding the importance of glycemic control and improved patient outcomes.

Background

Therapeutic glycemic control is paramount in the treatment of all patients with diabetes mellitus to prevent the occurrence of potentially life threatening comorbidities (ADA, 2014). In the pediatric population; ages birth to 18 years, the management of with type 1 diabetes mellitus (T1DM), requires constant parent and family involvement and care coordination. Provider and parent communication is critical in maintaining intensive medical management and glycemic control (Boot, Volkening, Butler & Laffel, 2012). A team of specialized providers, which includes a physician or advanced practice registered nurse (APRN), certified diabetes educator (CDE) and nutritionist typically manages the treatment of children with diabetes (ADA, 2015). Continuity among the team of providers in terms of recommendations for diabetes management, education and glycemic goals is critical in the development of a therapeutic treatment regimen (ADA, 2015).

The serum glycated hemoglobin or hemoglobin A1c (HbA1c) measurement is the most important long-term measurement of glycemic control and treatment effect (Peterson, Omonyi, Amin, Shea, Okorodudu & Ju, 2010). The HbA1c is reflective of the average blood glucose measurement of a patient over a three-month period, it is most often expressed as a percentage and the normal value is < 6% (Patino-Fernandez, Eidson, Sanchez & Delamater, 2009). The goal of treatment in diabetes is to maintain the patient's blood glucose with in a specific therapeutic range, which would be reflected by the HbA1c measurement at or below a recommended target percentage. According to current recommendations, the HbA1c should be measured at each follow up diabetes visit; which should occur every three months (ADA, 2015). Providers have the opportunity at the time of the visit to make adjustments in insulin dosing and other aspects in treatment based on the HbA1c level (ADA, 2015).

The American Diabetes Association (ADA) has recently revised the recommended practice guidelines for provision of care for children with T1DM. These guidelines include, among many other recommendations, a target measurement for the HbA1c of < 7.5% for all children with T1DM (ADA, 2015). Prior to 2015, the ADA HbA1c guidelines were based on the age of the child and allowed for individualization of management and providers' preferences in practice. Many providers were afraid that severe hypoglycemic events in children were not only dangerous but if occurred frequently, could decrease intellect over time (Swift et al., 2010). In fact, de Beaufort and his team found the opposite to be true. Their research identified that in children less than 11 years, the more intensively managed the glycemic control, the lower the incidence of severe hypoglycemia ($p < 0.001$) (de Beaufort et al., 2013).

Clinical practice guidelines establish standards and provide processes that can be used to assess the quality of care provided to patients with T1DM (ADA, 2015). Use of guidelines ensures that providers and institutions are providing quality care that is current and evidenced based (Amed et al., 2013). Despite these established guidelines, studies have found that there is a significant amount of inconsistency among practices and providers in adherence to the current ADA recommendations (Amed et al., 2013). Providers who are compliant with current practice recommendations and follow practice guidelines will be more likely to attain glycemic control in their patients (ADA, 2015). Furthermore, HbA1c levels that are reflective of recommended therapeutic metabolic control would result in optimal health outcomes for the patient with T1DM (Alligood, 2010). Children with T1DM who have adequate glycemic control are healthier, more active and intellectually competent than those who have poor glycemic control (de Beaufort et al., 2013).

The purpose of this quality improvement project is to promote and measure provider compliance with recently updated ADA glyceemic guidelines in the treatment of children with T1DM in a hospital based diabetes and endocrinology clinic. The aim of this computer-based documentation intervention is to demonstrate the level of provider compliance and provide data that HbA1c levels have been evaluated at each visit and the care of the child with T1DM is being directed in terms of the current ADA guidelines. The short-term goal of the project is to utilize the compliance outcome data to evaluate current provider practice regarding glyceemic control and how it relates to the guidelines. The long-term goal of the project is to improve multidisciplinary collaboration and continuity of care through effective patient care coordination for children and their families with T1DM (Raaijmakers, Hamers, Bagchus, de Vries, & Kremers, 2013).

Theoretical Framework

Imogene King's Theory of Goal Attainment (TGA) was the middle range theory chosen to address this practice problem, as it fits the phenomenon of care coordination. The TGA predicts the outcome of goal attainment through the successful transaction between provider and patient/family (Alligood, 2010). Through concepts of communication, perception, interaction and transaction King explains the process of goal attainment between provider and patient (Alligood, 2010). If human beings are innately purposeful and action oriented, the TGA assumes their relationships will be goal oriented (King, 2007). In the process of developing and achieving mutual goals, providers and families perceive the activity to be therapeutic and congruency of roles will occur (King, 2007). King's theory proposes that goals can be measured by outcomes, that goal attainment is predictable and as goals are attained health improves (King, 2007) (see Appendices A and B).

Patient goal attainment of a HbA1c measurement that is within the recommended therapeutic target would reflect optimal management of the disease in the child with T1DM (Swift et al., 2010). Standardization of care for children with T1DM can be achieved through treatment that is based on clinical practice guidelines established through evidence obtained by quality, well designed research (de Beaufort et al., 2013). The disease management that results will foster positive communication and interactions, congruent perceptions and therapeutic transactions between providers and families (Allgood, 2010).

Review of the Literature

Current research relating to glycemic control in the pediatric patient with T1DM is abundant. For this project the literature discussion will focus on the relationship between the provision of care and HbA1c outcomes as they correspond to current practice guidelines for the population of interest. The literature review begins with evidence from two studies by the Hvidoere group that focus on differences in glycemic control as it relates to care delivery across diabetes centers. The next portion of the evidence looks at process and outcomes of diabetes care. Finally, in order to understand the influence of practice guidelines in diabetes care, two studies are reviewed that address the influence of provider awareness and compliance with clinical guidelines and outcomes on glycemic control in children with T1DM.

The Hvidoere Study Group on Childhood Diabetes was established to perform high quality collaborative multicenter research in children and adolescents with T1DM. The research performed by this group aims to evaluate diabetes care and outcome trends internationally. In the studies reviewed for this work, researchers looked at glycemic target setting in the management of diabetes in children and adolescents with T1DM (Swift et al., 2010, de Beaufort et al, 2013). The researchers in the first study concluded that lower target goals for HbA1c levels and

consistency among diabetes care provision in a group of adolescent subjects was significantly associated with lower HbA1c levels ($F=16.0$, $df=15$, $p < 0.001$) (Swift et al., 2010). In another study researchers evaluated HbA1c of younger children with T1DM and concluded there was a significant variation in HbA1c levels across centers ($F=22.24$, $df= 17$, $p < 0.001$), which could likely be attributed to the composition and continuity of the diabetes team of providers (de Beaufort et al., 2013). The Hvidoere Study Group findings strongly suggest that lower glyceemic goal setting by providers as well as consistency of care and communication of provider expectations was related to better glyceemic control in children with T1DM.

Other researchers have tried to replicate the results of the Hvidoere study group in an attempt to generalize the findings in other populations. Doggen (2012) reviewed several diabetes quality improvement (QI) initiatives regarding process and outcomes of diabetes care in Belgian children. The aim of the research was to develop a process to collect feedback on provider performance in hospital based multidisciplinary pediatric diabetes centers and to identify barriers and facilitators in improving glyceemic control and thereby improve diabetes care (Doggen et al., 2012). Additionally, the researchers found a correlation between standardization and continuity of care by diabetes teams between centers, and improved HbA1c levels ($F 0 3.00, P<0.001$) (Doggen et al., 2012). The evidence from this study reinforces the findings from the Hvidoere group research; that consistent multidisciplinary diabetes care provision is significant in the improvement of glyceemic control of children with T1DM.

Studies have also found that provider knowledge of recommendations from clinical practice guidelines is an important facilitator in achieving positive glyceemic outcomes in children with T1DM. Hanberger, Samuelson, Bertero & Ludvigsson (2012) studied diabetes team members in pediatric diabetes centers to evaluate how structure, process and policy

influence HbA1c levels. The researchers identified diabetes treatment centers with the highest, lowest and decreasing HbA1c measurements. The study found that practice policy in regard to glycemic control influenced the HbA1c measurement (Hanberger et al., 2012). The centers with the lowest and decreasing HbA1c values reported more consistent compliance with the practice guidelines than those with the highest HbA1c values (Hanberger et al., 2012). Additionally, providers in the centers with the lowest HbA1c had clearer instructions and expectations regarding diabetes care to patients and families (Hanberger et al., 2012).

Amed (2013) and his group found that less than half of patients with T1DM received the level of care that was recommended by the international guidelines. Patients who were seen by a diabetes specialist as opposed to a general practitioner were more likely to receive care that met recommendations (54.3 %) (Amed, Nuemberger, McCrea, Reimer, Krueger, Aydede, Ayers, & Collet, 2013). Additionally, as children with the disease aged, overall adherence to guidelines decreased and glycemic control became more difficult (Amed, et al., 2013).

The findings from these research studies support the hypothesis that children with T1DM are more likely to have better management of their disease when specialized providers, utilizing a coordinated comprehensive team approach, deliver their diabetes care. Additionally, provider awareness and utilization of clinical practice guidelines in the management of patients with T1DM will help to foster continuity of care and subsequent adherence to evidenced based recommendations for the management of these patients. The use of clear and consistent communication among providers, patients and families in regard to expectations and setting of glycemic targets is strongly associated with improved HbA1c outcomes (Swift, et al., 2010).

Methods

Design, Sample and Setting

A non-experimental predictive correlational design was used to evaluate the relationship between provider knowledge of current ADA glycemic guidelines in children with T1DM and compliance with the use of a documentation phrase in the electronic medical record (EMR) note. This quality improvement project was conducted over a six-week period in the outpatient endocrinology and diabetes center of a large urban medical center that serves a diverse patient population. The convenience sample consisted of a total of 9 diabetes care providers: three pediatric endocrinologists, three pediatric nurse practitioners and three certified diabetes educators; two of which were also nutritionists.

Prior to implementation of the project, the hospital informational technology (IT) staff preformed an audit of the EMR to identify current pediatric patients with T1DM and their HbA1c levels. The audit parameters were limited to all patients having a HbA1c level of $>7.5\%$, which would be reflective of patients who have HbA1c measurements greater than the recommendations set by the 2015 ADA guidelines. The findings from the HbA1c EMR audit and the purpose of the project were then related to the provider group during a regularly scheduled meeting for providers. The project leader asked the diabetes providers to complete a three question paper survey created to assess provider knowledge of current pediatric ADA glycemic recommendations (see Appendix D). The blank surveys were given to the providers in an unsealed envelope and they were instructed to complete, refold, replace the survey and seal the envelope and the project coordinator collected them. There were no identifiers on the survey except provider role, i.e.; nutrition, CDE, PNP or MD. The project leader entered and converted

the survey data into an electronic format and the completed surveys were kept in a secured desk in a locked office (see Appendix E).

The standard of care in the clinic is that HbA1c levels for all patients are measured at each visit; which should occur every 3 months. The result of the HbA1c is then populated into the assessment portion of the provider note in the patient's electronic medical record (EMR). At the time of the project implementation there was not a consistent process for providers to document the implications of the HbA1c measurement in the EMR and how it relates to treatment and glycemic control, nor was there a mechanism to address HbA1c levels that fall outside of the recommended range in the EMR note. To address this gap the project leader instructed the participating providers to create a standardized documentation comment in the form of a "smart phrase". The phrase; created by the providers, was to be manually populated into the assessment portion of the visit note by the providers. The phrase was intended to be included in the charts of all children with T1DM that were being seen by each provider during the implementation phase. The phrase was titled "ADAGUIDELINEASSESSMENTPED" and the content was; "We have discussed the ADA guidelines, which recommend the Hemoglobin A1C be less than 7.5% in children with Type 1 Diabetes". Use of this smart phrase established that the guideline driven target HbA1c was addressed by the provider and if the HbA1c is out of the recommended range the provider had the opportunity to document the proposed plan for decreasing the value in the future.

Measures to Protect Subjects

Prior to project implementation an IRB Analyst determined that the project had met the definition of *Not Human Subjects Research* (NHSR) and determined IRB oversight was not required (Appendix C). The providers were assured that their participation in this survey was

voluntary and their responses will be anonymous. Consent was obtained by the project leader at the time of survey administration when briefing providers on the project details (Appendix D). Providers were assured that the results from the survey would be anonymous and the findings from the project would be disseminated to clinic administration and used for quality improvement purposes. They were guaranteed that their participation will be voluntary, and that they would be able to withdraw at any time during the intervention. Results from the project data analysis of provider documentation, regardless of the role performed, will be confidential and will not be used to evaluate provider performance or productivity by clinic or hospital administration.

Results

Data Collection and Analysis

Data for the project were collected after the providers participated in the project for 6 weeks and 122 patient visits. This criterion was chosen because it was felt this was a reasonable amount of time and/or number of visits to evaluate provider documentation compliance. Some patients saw more than one provider on the day of their appointment; therefore a visit with any provider on an appointment day was a data point. For example, if a patient were scheduled to see the Physician as well as the CDE there would be two visits for the same patient on the same day. Provider compliance in terms of smart phrase use was measured as yes or no. This nominal compliance data was collected by manual retrospective chart review by the project leader during and after the project was completed and compliance was tracked and documented into an Excel spreadsheet. The results were; of the 122 patient visits, providers used the phrase 72 times (59%). Of those providers, the PNP's used the phrase 71% (n=68) of the time, physicians used it 43% (n=3) and the CDEs used it 1 time (0.05%). As shown in Table 1, the PNP's saw the

majority of the patients (96 visits), the physicians had 7 visits and the CDEs had 19 visits. The Fisher's Exact, a nonparametric test was used to evaluate the significance of the data due to low expected frequencies and small, uneven group sizes. The Fisher's Exact test for significance showed that there was a significant difference in use of the phrase between the groups. The PNPs had a significantly higher use of the phrase per patient visit than the other two groups of providers combined ($p = < .001$) (see Table 2).

Discussion

The results of this project reflect that providers discussed ADA guideline expectations at nearly 60% of the patient visits during the implementation period. The PNPs used the phrase at a significantly higher frequency than the physician and the CDE providers. This may have been due to multiple factors. There was an unusually high rate of turnover by the clinic providers in the 4 month period prior to the implementation; 3 new physician providers were hired and trained in the division. In contrast, the PNP providers were well established in the practice with many years of care provision in pediatric endocrinology. Additionally, it is possible the PNPs identified with the project because it was being lead by a fellow PNP.

There were 2 physician providers and 2 CDE providers missing from the initial provider meeting where the project details were outlined. It is possible this may have caused a lack of "buy in" for those providers, as they did not realize the value and process of the intervention. In an attempt to compensate for the absence of the providers, the background and implementation instructions were given just after the meeting by a project champion who was also a provider involved in the project. Because of the need for secondary training the communication of the project specifics may not have been given consistently or completely.

It was speculated that there may have been a high level of compliance in phrase use at the beginning of implementation period due to increased motivation, but participation would wane as the project progresses, but this phenomenon was not seen in this project. In follow up projects, if this were to occur, it may be beneficial for the project leader to attend another provider meeting to reinforce the specifics of the intervention and address questions or problems.

Support of the project from clinic administrators and division chief facilitated the adoption of the project by the providers. The clinic and hospital administration as well as the providers had a vested interest in the completion of the project and outcomes that are indicative of consistent and guideline driven quality care provided to the pediatric T1DM population. A presentation of project outcomes is planned in the near future for the providers and it is intended to promote feedback and facilitate ideas from the provider team and project leader for recommended follow up projects. These could include replication of the project on a larger scale for longer implementation periods within the diabetes and endocrinology center as well as other outpatient departments in the hospital.

Technologic support was imperative for the success of the project and is considered a major facilitator for this project. Continuance of provider documentation using a mandatory imbedded phrase versus a smart phrase could be considered to provide a simpler method for data collection, expedited real time compliance monitoring and would assist in the ongoing measurement of care delivery based on current recommended guidelines.

Imogene King's theory supports the concept of goal attainment through the standardization of quality care, and medical treatment that is based on consistent interactions, congruent perceptions and therapeutic transactions (de Beaufort et al., 2013). Positive communication between providers and families in the management of their child's T1DM

requires providers to actively participate and maintain the process of goal attainment through consistency of messaging and treatment. Processes to facilitate therapeutic communication and goal attainment fall within the scope of the advanced practice provider who is an expert clinician who has been prepared with a practice doctorate degree. The practitioner with a DNP degree has the ability to navigate the increasingly complex systems and processes that influence the delivery of health care. The DNP aims to have an impact on and improve healthcare delivery and patient care outcomes (Chism, 2013). The DNP analytically and critically evaluates the current evidence related to practice outcomes, and practice settings to determine the best methodology to improve practice quality (Chism, 2013). To that end, it is evident that the goal of therapeutic HbA1c levels can be achieved through utilizing clinical practice guidelines to direct evidenced based care to patients and families and to promote consistent communication among providers. The identification of EMR documentation as a vehicle to improve patient care promotes the inclusion of guideline driven care and provider adherence to guideline recommendations. Administrators would then be able to show that the treatment being delivered in specific departments meets quality care criteria and practice guidelines were recognized and being utilized in treatment.

Translation and Dissemination

An important component of translation of the evidence is dissemination; it reinforces new knowledge and ongoing dialog between researchers and clinicians. It is critical to share the information discovered in the process of project completion to a diverse healthcare delivery audience. Dissemination is the process of communicating the results of the project so that change will occur and innovations will be adopted (Dudley-Brown, 2012). This project will be disseminated internally at the clinic level where the project was implemented. Providers, administrators and upper management will be invited to an oral presentation of an overview of

the project process and results. An open dialog is planned to allow attendees to provide feedback to the project leader and clinic administration regarding the project. Suggestions for expansion and increasing the implementation period will be addressed internally at the site. Additional efforts to disseminate the findings will be offered at advanced practice nursing grand rounds with in the institution. This effort will facilitate an understanding of the simplicity of the project and potentially stimulate interest in replicating it in other patient populations.

To meet the requirements of external dissemination an abstract for podium presentation will be submitted to the Pediatric Endocrinology Nurses Association for inclusion in their annual conference in May 2017. Additionally, the completed manuscript will be submitted to the Journal of Pediatric Nursing, Endocrinology section and the Journal of Pediatric Health Care to be considered for publication.

Dissemination is the final step in the process of translation of evidence into practice. In an attempt to avoid ethical breeches at the intuitional level, project outcomes containing sensitive data and information will not be released until the information has been presented internally. Institution administrators will have an opportunity to review the pre-implementation and post-implementation data and evaluate what could be shared outside of the institution (Dudley-Brown, 2012).

Summary and Conclusions

This DNP lead QI project utilized simple methodology to identify gaps in guideline recommendations and actual provision of care in a focused population of chronically ill children. Use of the smart phrase communicated clear and consistent messaging to caregivers of the children with T1DM seen in the diabetes clinic during the intervention phase of the project. Clear and consistent glycemic expectations were delivered to patients and families, and specific

provider terminology provided evidence that guidelines were addressed and incorporated this into the EMR visit note. The data collected in this project reflected that the majority of families seen during the implementation period had provider discussions regarding ADA recommended glycemic control but it is not possible to determine if this was discussed in the visits without documentation of the smart phrase. The project was inexpensive, required negligible IT support, and phrase usage required minimal effort by the provider in the documentation process. Care provision that is current and evidenced based must be a priority for all populations. As a leader in the clinical environment, the DNP advanced practice provider is in an advantageous position to identify gaps in care and evaluate current evidence and clinical processes. The DNP is educated to identify and promote projects that provide solutions to close the gaps between current research recommendations and existing practice. The evidence is clear; the sooner adequate and appropriate care is provided to patients with chronic illness the better the long term health outcomes for the patient and society in general. Through leaned leadership skills the DNP clinician is trained to be a provider that can identify the need for process change, facilitate these changes based on current evidence and evaluate outcomes of the process change. The DNP leader can have a significant impact on the future of healthcare because of the unique practice knowledge and skills they bring to the table of health care provision. It is imperative that this level of practice be utilized and experienced by patients, other providers and members of the health care delivery team to communicate and promote value to the role. The delivery of quality healthcare must be multifocal and the DNP can offer a compassionate and scientific approach to the process. Healthcare is changing rapidly and a system that can respond quickly to shifts in care will prove to have a solid foundation and depth of strength. The role of the DNP is adaptable and will continue to evolve in response to changes in health care delivery system but it

is imperative that DNP providers create a brand that is not only specialty specific but also universal in order to market the uniqueness of the role in the process of health care delivery.

References

- Amed, S., Nuemberger, K., McCrea, P., Reimer, K., Krueger, H., Aydede, S., Ayers, D. & Collet, J. (2013) Adherence to clinical practice guidelines in the management of children, youth and young adults with type 1 diabetes- A prospective population cohort study. *The Journal of Pediatrics*, 168 (2) 543-548. doi:10.1016/j.peds.2013.01.070
- Alligood, M. R. (2010). Family healthcare with King's Theory of Goal Attainment. *Nursing Science Quarterly*, 23(2), 99-104. doi: 10.117/0894318410362553
- American Diabetes Association (2015). Position statement; standards of medical care in diabetes children and adolescents. *Diabetes Care*, 38 (1) S70-76.
- Boot, M., Volkening, K., Butler, A. & Laffel, L.B., (2012). The impact of blood glucose and HbA1c goals on glycemic control in children and adolescents with type 1 diabetes. *Pediatric and Young Adult Section, Genetics and Epidemiology Section*, Joslin Diabetes Center, Boston, MA. doi: 10:1111/dme,12083
- Chism, L. A., (2013). *The Doctor of Nursing Practice; A Guidebook for Role Development and Professional Issues* (2nd ed.) Burlington, MA: Jones and Bartlett.
- de Beaufort, C.E., Lange, K., Swift, P., Aman, J., Fergus, C., Castano, L., . . . Mortenson, H. B. (2013). Metabolic outcomes in young children with type 1 diabetes differ between treatment centers: the Hvidoere Study in Young Children 2009. *Pediatric Diabetes*, 14, 422-428. doi: 10.1111(1) 1399-5448.2012.0092.x
- Doggen, K., Debacker, N., Beckers, D., Casteels, K., Coeckelberghs, M. Dooms, L., . . . Van Casteren, V. (2012). Care delivery and outcomes among Belgian children and Adolescents with Type 1 Diabetes. *European Journal of Pediatrics*, 171 1679-1685.

doi: 10:1007//s00431-012-1809-2

Dovc, K., Telic, S., Lusa, L., Bratanic, N., Zerjav-Tansek, M., Kotnik, P., . . . Bratina, N.

(2014). Improved metabolic control in pediatric patients with type 1 diabetes: a nationwide prospective 12-year time trends analysis. *Diabetes Technology and Therapeutics*, 16 (1) 33-40. doi: 10:1089/dia.2013.0182

Dudley-Brown, S. (2012). Dissemination of Translation in K. White & S.Dudley-Brown

Translation of Evidence into Nursing and Healthcare Practice (pp243-253). New York, NY. Springer.

Hanberger, L., Samuelson, U., Bertero, C. & Ludvigsson, J. (2012). The influence of

structure, process and policy on HbA1c levels in the treatment of children and adolescents with type 1 diabetes. *Diabetes Research and Clinical Practice*, 12(96), 331-338.

doi:10:1016/j.diabetes.2012,01.016

King, I. M. (1981). *A Theory for Nursing systems, concepts, process*. New York, Wiley.

King, I. M. (2007). Kings Conceptual System, Theory of Goal Attainment and

Transaction Process in the 21st Century. *Nursing Science Quarterly*, 20(2) 109-116. doi:10.1177/0894318407299846.

Patino-Fernandez, A.M., Eidison, M., Snchez, J, & Delamater, A. (2009). What do youth with type 1 diabetes know about the HbA1c test? *Children's Health Care*, 38, 157-167.

doi:10:1080/02739610902813328

Peterson, J., Omonyi, F., Amin, M., Shea, T., Okorodudu, A. & Ju, H. (2010). Hemoglobin A1c:

assessment of three POC analyzers relative to a central laboratory method. *Clinica Chimica Acta*, 411(23), 2062-2068.

doi: 10:1016j.cca.2010.09.004

Raaijmakers, L., Hamers, F., Bagchus, C., de Vries, N. & Kremers, S. (2013). Perceived facilitators and barriers in diabetes care: a qualitative study among health care providers in the Netherlands. *BioMed Central, Family Practice*. 14 (114) 1-9. Retrieved from <https://www.biomedcentral.com/1471-2295/14/114>

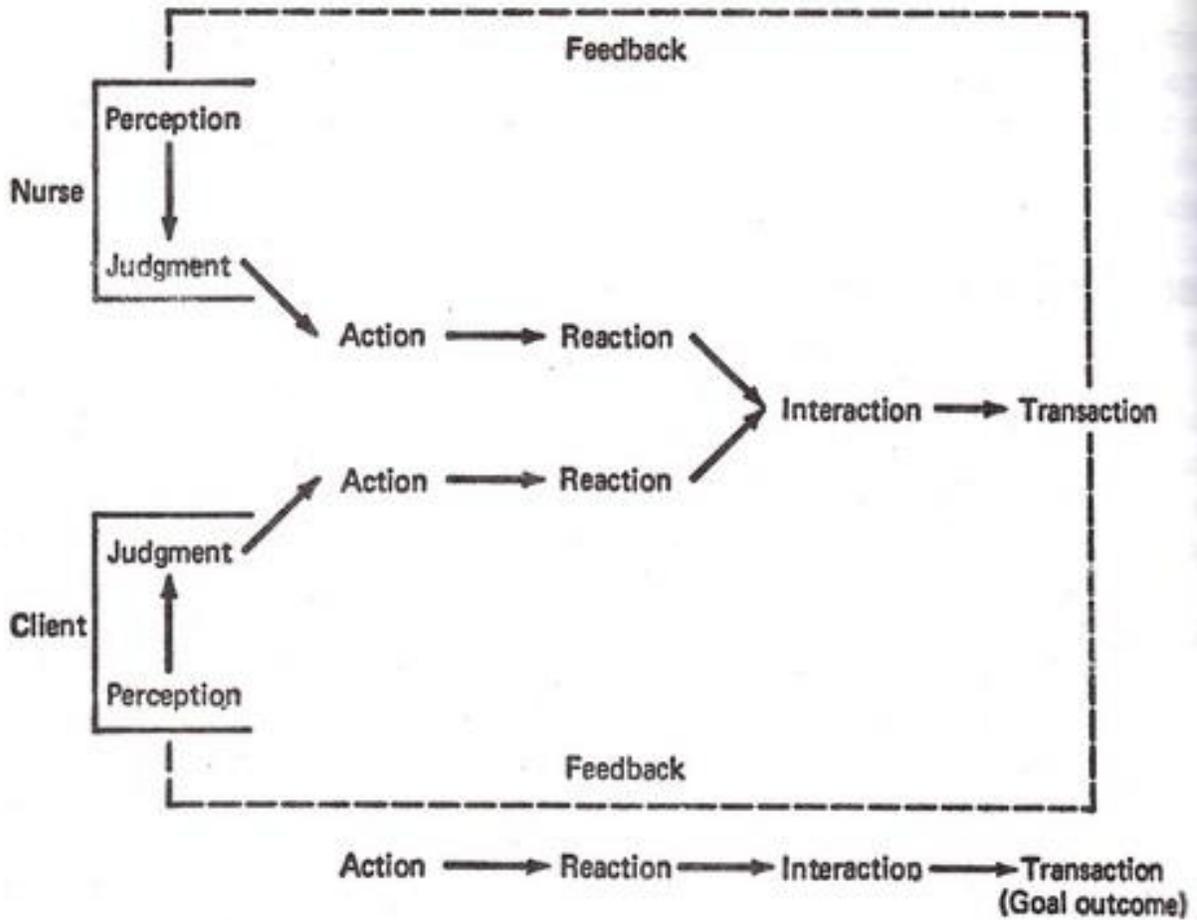
Silverstein, J., Klingensmith, G., Copeland, K., Plotnick, L., Kaufman, F., Laffel, L., . . . Clark, N. (2005). Care of children with and adolescents with type 1 diabetes. A statement of the American Diabetes Association. *Diabetes Care*, 28(1), 186-212.

Swift, P., Skinner, T., de Beaufort, C., Cameron, F., Aman, J., Annstoot, H., . . . Ackerman, R. (2010). Target setting in intensive insulin management is associated with metabolic control: the Hvidoere Childhood Diabetes Study Group center difference study 2005. *Pediatric Diabetes*, 11, 271-278.

doi.11111j1399-5448.2009.00596.x

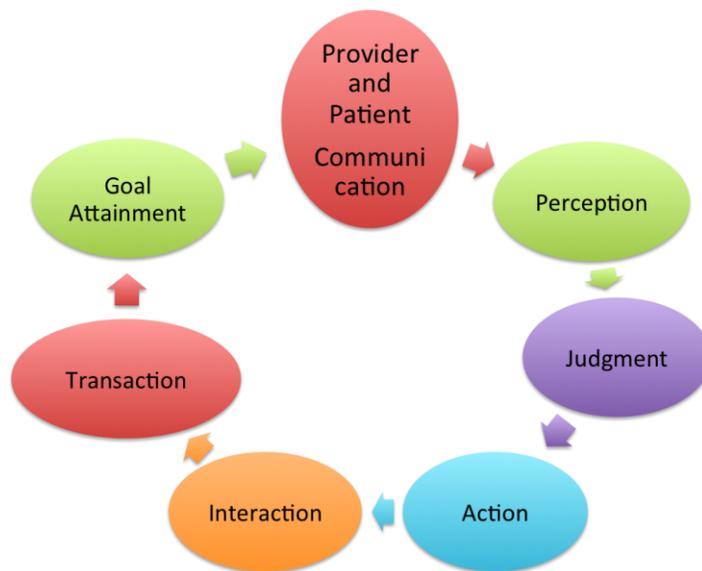
Appendices

Appendix A; King's Model of Goal Attainment



King, I. M. (1981). *A Theory for Nursing systems, concepts, process*. New York, Wiley.

Appendix B: Kings Model of Goal Attainment adapted from King, I. M. (1981). *A Theory for Nursing systems, concepts, process*. New York, Wiley.



Appendix C: IRB Review

Not Human Subjects Research (NHSR) Confirmed

To: Susan Bindon

Link: [HP-00064977](#)

An IRB Analyst has reviewed the information provided and has determined that the project meets the definition of *Not Human Subjects Research* (NHSR). IRB oversight is not required and no further actions are required.

Description:

Submission Title: Provider Compliance with Glycemic Guidelines

POC: Susan Bindon

Please contact the HRPO at 410-706-5037 or HRPO@umaryland.edu if you have any questions.

Appendix D: Provider Survey

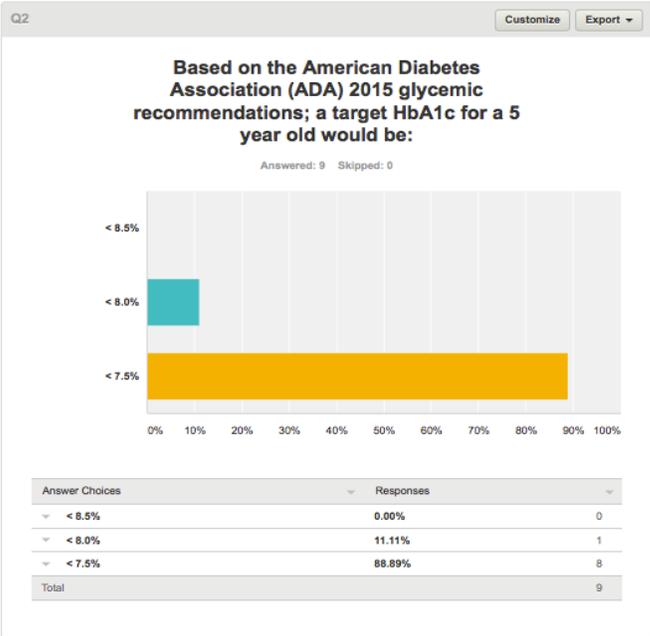
Thank you for participating in the provider survey and the quality improvement project to measure provider compliance with glycemic guidelines in children with Type 1 Diabetes. By completing this survey you agree to participate in the project.

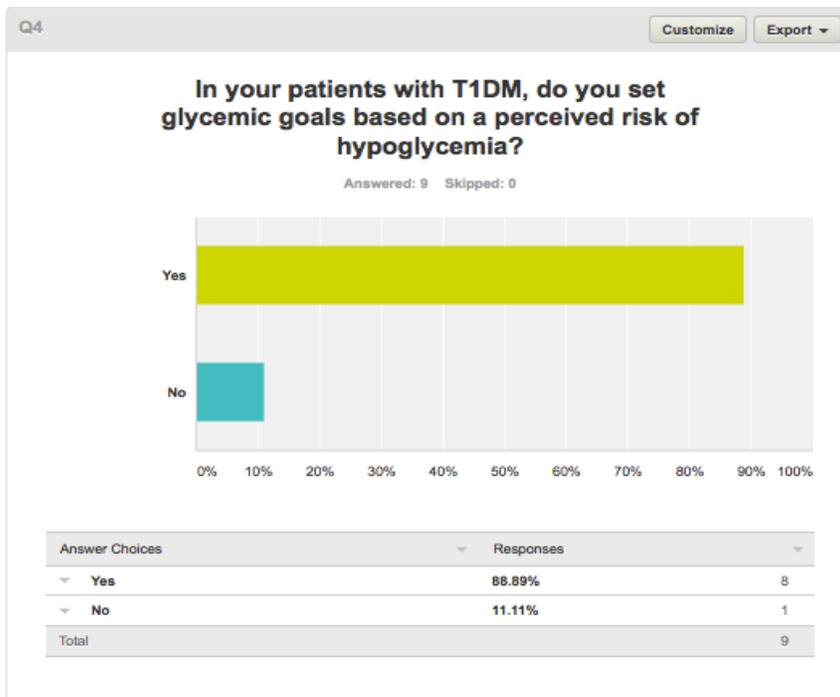
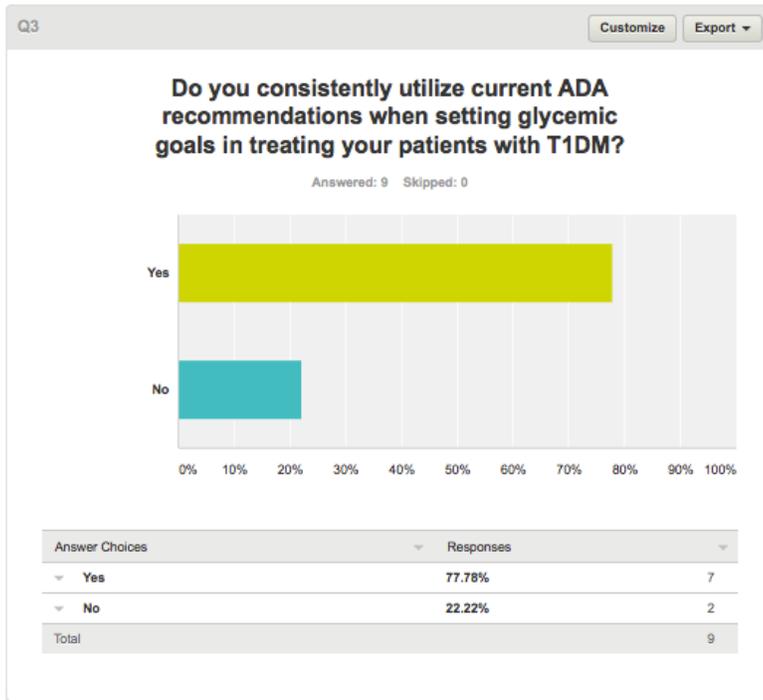
Provider survey

Please mark the correct answer to the questions below:

1. What is your occupation? You may choose more than one answer.
 - a. Pediatric endocrinologist
 - b. Pediatric advanced practice nurse
 - c. Registered nurse
 - d. Nutritionist
 - e. Certified diabetes educator
 - f. Other; please specify _____
2. Based on the American Diabetes Association 2015 glycemic recommendations; a target HbA1c for a 5 year old with T1DM would be:
 - a. < 8.5%
 - b. < 8 %
 - c. < 7. 5%
3. Do you consistently utilize current ADA recommendations when setting glycemic goals in treating your pediatric patients with T1DM?
 - a. Yes
 - b. No
4. In your patients with T1DM, do you set glycemic goals based on a perceived risk of hypoglycemia?
 - a. Yes
 - b. No

Appendix E: Provider Survey Results





Appendix F: Evidence Review Table

| # | Author | Date | Evidence Type | Sample & Sample Size | Results/ Recommendations | Limitations | RATING |
|---|-------------------------|------|---|--|--|--|-----------------|
| | | | | | | | Strength |
| | | | | | | | Quality |
| 1 | de Beauafort, C. et al. | 2013 | Non-experimental descriptive cross-sectional des8ikmign | Children with T1DM 0-11years 1107 | Glycemic control differed between diabetes centers for children < 11yrs (p=<0.001) Glycemic control was better in children<11yrs. The staff application of treatment is more effective than the treatment itself in lowering HbA1c | No randomization and therefore no control group Different insulin regimens were used. Low socioeconomic status only No intervention | III Good |
| 2 | Dovc, K, et al. | 2014 | Non-experimental descriptive prospective | Children with T1DM 0-22 years 886 | HbA1c levels improved in the entire study population over the 12-year observation period (p = < 0.001), which is associated with treatment modality. | Insulin regimens were different No control group No intervention | III Good |
| 3 | Swift P. et al. | 2010 | Non-experimental descriptive cross-sectional | Adolescents with T1DM 2062 | Questionnaire given to patients and parents regarding perceptions of HbA1c levels Parents and patients perceptions differed across centers and lower HbA1c levels were associated with greater consistency and low target HbA1c goals set by provider teams (p = < 0.001). | There were differences in the make up and numbers of provider teams and not all teams set the same target for HbA1c | III Good |
| 4 | Doggen, K. et al. | 2012 | Non-experimental descriptive retrospective | Belgian Children with T1DM 0-19 years | Outcomes of care were similar to other European countries. Positive outcomes; HbA1c levels within target ranges were associated with family structure, | Sampled only Belgian children that received care from HBMC's.. | III |

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|---|------------------------|------|---|---|---|--|-----------------|
| | | | cross-sectional | | continuity of care delivery and insulin treatment | | Good |
| 5 | Boot, M. et al. | 2012 | Non-experimental, descriptive cross-sectional | Children with T1DM 8-16 years 974 | Survey of parents: When parents of T1D reported HbA1c goals of between 6-8% the levels were significantly better than those parents reporting goals of >8% (p=.02) and parents glycemic goals were significantly linked with their physicians glycemic goals for their child.(p=<.0001). | Did not assess the correlation of parents goals and other members of the diabetes care provider team | III High |
| 6 | Raaijmakers, L. et al. | 2013 | Qualitative grounded theory design | Dutch providers of diabetes care; all types, all ages 153 | Interviews with providers that care for patients with DM. Identified perceived barriers and facilitators to providing care to diabetics in the Netherlands. Care coordination that included CDE and practice nurses that specialized in Diabetes and benchmarking for QI were major facilitators in providing optimal patient care. | Small selective sample size Lack of generalizability Lack of consensus from the group on some issues | III Good |
| 7 | Hanberger, L. et al. | 2012 | Qualitative grounded theory design | T1DM providers from diabetes centers in all areas of Sweden 18 | 15 centers with high (5), low (5) and greatest decrease (5) in HbA1c measurements were identified and providers were surveyed on structure, policy and process of HbA1c levels. The greatest compliance to following HbA1c guidelines was in the center with the lowest A1c and to a lesser extent the centers with the decreasing A1c. The differences were attributed to the clarity of | Relatively small sample size | III |

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|---|-----------------|------|--|--|---|--|-----------------|
| | | | | 109 | the messages given to the patients and the families of the low and lowering HbA1c centers. | | Good |
| 8 | Amed, S. et al. | 2013 | Non-experimental Descriptive prospective cohort design | Canadian (BC) Children age1-24 years with T1DM 1472 | Used administrative data over a 7 year period to identify outcome measure of pts “at goal” which was defined as treatment compliance and follow up based on recommended guidelines for T1D. Findings 54% had poor adherence to guidelines and therefore the treatment of T1D did not meet national and International standards. | Data may have not reflected all cases in BC and may have been incomplete. POC HbA1 testing may not have been entered into the MSP billing dataset Study did not differentiate between type of medical provider, pediatrician vs Pediatric endocrine team | III Good |

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| 9 | Patino-Fernandez, A. et al. | 2009 | Non-experimental, descriptive cross-sectional | T1DM 11-16 years with a mean HbA1C of 10.5% | After meeting with the CDE and MD and patients and parents were instructed in the level of HbA1c and the meaning of glycemic targets among other aspects of the disease the patients were interviewed by trained staff.13% of the subjects were able to describe the HbA1c test and daily glycemic goals correctly Older children were more likely to answer correctly (p=.01) and the higher the SES was related to knowing what HbA1c percent correlated to fair (p=.08) and poor control (p=.03) and this was not related o length of time having the disease (p=. | | III |
| 10 | American Diabetes Association | 2015 | Systematic review | 79 N/A | Practice guidelines and recommendations for the care of children with T1D All children with T1D should be cared for by a multidisciplinary team and seen quarterly for medical treatment and monitoring. HbA1c for all patients should be < 7.5% with few exceptions. | | Good IV High |

| | | | | | | | |
|----|-------------------------|------|-------------------|-----|--|--|------------|
| 11 | Silverstein, J., et al. | 2005 | Systematic Review | N/A | Recommendations for medical care for the child with T1D that reflect age specific considerations for management of aspects of the disease; glycemic control, insulin regimens and potential comorbidities. | | IV High |
|----|-------------------------|------|-------------------|-----|--|--|------------|



Table 1. Phrase Usage by Provider

| Type of provider | Used phrase | % of phrase use/visit | Did not use phrase | % of time phrase was not used | Total # visits for provider type |
|------------------|-------------|-----------------------|--------------------|-------------------------------|----------------------------------|
| PNP | 68 | 70.8% | 28 | 29% | 96 |
| MD | 3 | 42% | 4 | 57% | 7 |
| CDE | 1 | 5.3% | 18 | 95% | 19 |
| Total | 72 | 59% | 50 | 41% | 122 |

Table 2. Fischer's Exact Results of Significance

| Type of provider | Yes | No | P value |
|------------------|-----|----|---------|
| PNP | 68 | 28 | <.001 |
| MD + CDE | 4 | 22 | <.001 |
| Total | 72 | 50 | |