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Insulin Injection Re-Education for Improved Glycemic Control

Daniela Shon
University of San Diego, danihkim@gmail.com

UNIVERSITY OF SAN DIEGO

Hahn School of Nursing and Health Science

DOCTOR OF NURSING PRACTICE

Insulin Injection Re-Education for Improved Glycemic Control

by

Daniela Kim Shon DNPc, BSN, RN, PHN

A Doctor of Nursing Practice Portfolio presented to the

FACULTY OF THE HAHN SCHOOL OF NURSING AND HEALTH SCIENCE

UNIVERSITY OF SAN DIEGO

A portfolio presented to the

FACULTY OF THE HAHN SCHOOL OF NURSING AND HEALTH SCIENCE

In partial fulfillment of the requirements for the degree

DOCTOR OF NURSING PRACTICE

May / 2020

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Documentation of Mastery of DNP Program Outcomes

Final Manuscript

Insulin Injection Re-Education for Improved Glycemic Control

Daniela Kim Shon

Razel Milo PhD, DNP, MSN, FNP-C, RN

University of San Diego

April 21, 2020

Abstract

Title: Insulin Injection Re-education for Improved Glycemic Control

Background: Patients on insulin therapy often continue to show suboptimal glycemic control. Data from adult patients with T2DM have demonstrated that 56.1% had poor control, despite adherence to treatment, oral and injectable.

Poor glycemic control stems from many sources, including poor self-efficacy regarding insulin dosage adjustment, inaccurate insulin dosing, expired insulin, lipohypertrophy of the injection site and technique, and equipment issues.

Purpose: This project aimed to implement and assess the efficacy of re-education in the insulin injection technique for improved glycemic control.

Methods: This project was conducted based on the John Hopkins Nursing Evidence-Based Practice Model. Patients were asked to complete a short survey to evaluate their baseline knowledge. Then, correct answers were given and a short 10 minutes re-education instruction session happened over the phone, and with written materials. Written materials were sent in by mail. Follow up happened monthly over the phone. The latest HbA1C levels will be used as a baseline and then re-measured three months after the instruction session was conducted.

Results: Pre- intervention A1C average was 8.7, and it was dropped to 7.5 at the post-intervention A1C.

Conclusion: There is a knowledge gap among patients self-administering insulin and other injectables; healthcare providers must be assessing their knowledge and provide refreshers periodically.

Insulin Injection Re-Education for Improved Glycemic Control

Around 90% of patients who have diabetes are type 2 (IDF Diabetes Atlas, 2017). In this common type of diabetes, hyperglycemia is the result of both an inadequate production and inability of the body to respond appropriately to insulin, and is therefore insulin resistant (IDF Diabetes Atlas, 2017). Type 2 diabetes (T2DM) is a chronic and progressive; it has been projected that by the time of T2DM diagnosis, approximately 50% of pancreatic beta-cell function has already been lost, with almost 4% subsequent loss of function per year (Bretzel, Eckhard, Landgraf, Owens and Linn, 2009).

Background and Significance

Initial treatment includes diet and lifestyle changes, weight reduction, and diabetes self-management education, commonly along monotherapy with Metformin (Wexler, Nathan and Mulder, 2019). Most patients have a successful initial response to oral anti glycemic therapy. Still, an analysis from the United Kingdom Prospective Diabetes Study (UKPDS) indicated that after three years of the initial diagnosis, 50% of patients would need an additional pharmacological agent, and by nine years, a whopping 75% of patients will require multiple therapies, the majority possibly in need of the addition of insulin therapy (Turner, Cull, Frighi et al., 1999).

Patients on insulin therapy often continue to show suboptimal glycemic control. A retrospective analysis of administrative data from adult patients with T2DM has demonstrated that 56.1% had poor glycemic control, despite adherence to treatment, both oral and injectable (Juarez, Ma, Kumasaka, Shimada and Davis, 2014).

Many factors contributed to poor glycemic control, ranging from unsustainable lifestyle challenges, psychosocial and emotional problems, treatment-related factors, and

lack of knowledge regarding glycemic levels and targets, poor self-efficacy regarding insulin dosage adjustment (Tong, Vethakkan and Ng, 2014), but also inaccurate insulin dosing, expired insulin, lipohypertrophy of injection site and technique and equipment issues (Sadler, 2017).

Purpose of Project

Sometimes, it seems like providers link uncontrolled glycemic control to many external factors, but not to the most straightforward issue, which could be an incorrect injection technique. Improper technique includes the use of inappropriate needle length, failure to rotate the injection site, the reuse of needles, all factors that can directly affect medication being absorbed in an unpredictable manner (Davel, Berg, Allie & Van der Merwe, 2016). Lypohypertrophy, the accumulation of fatty tissue caused by the poor site rotation; repeatedly injecting into the same area, is often overlooked, and it affects about half of the people using injectable therapy, resulting in variable absorption and erratic glycemic control (Diggle, 2014).

This educational project aimed to re-educate patients on best practices for insulin injection administration, selecting the optimal type of needle/syringe, the proper use of lifted skin fold where necessary, injection site rotation, storage and expiration of insulin, single use of needles, and finally, the optimal sequence for injecting (Diggle, 2014).

Methods

The pre-implementation group consisted of 10 patients, and the post-implementation, eight patients. The only criterion used to select participants was the current use of insulin or other injectables. No dosage adjustments were made during this period.

The following interventions were implemented for three months in a primary care clinic:

(1) Conducting a baseline educational survey to assess individual knowledge

(2) Re-educate patient on administration technique by reviewing the topics mentioned above

(3) Practice and use the "teach back" method utilizing an insulin injection pad along with a return demonstration (when/if meeting in person)

(4) Post education survey to assess new knowledge

(5) Monthly telephone follow up and

(6) Re-assess HgA1C after three months of re-education. All interventions were implemented by the DNP student. Patients were surveyed before and after re-education, along with a comparison of baseline and post-intervention hemoglobin A1C levels.

Education materials were printed directly from the medical technology company BD, which manufactures the materials widely utilized in insulin injections.

Evidence-Based Practice Model

The EBP model chosen to be followed in this project is the John Hopkins Nursing Evidence-Based Practice Model, which has a problem-solving approach to clinical decision-making, and is equipped with user-friendly tools to guide use. This model selection was made because it can incorporate clinical expertise and external scientific evidence with the patient and caregiver perspectives (Dang & Dearholt, 2017). It will suit the needs of the project and its tools will be very useful in guiding the process.

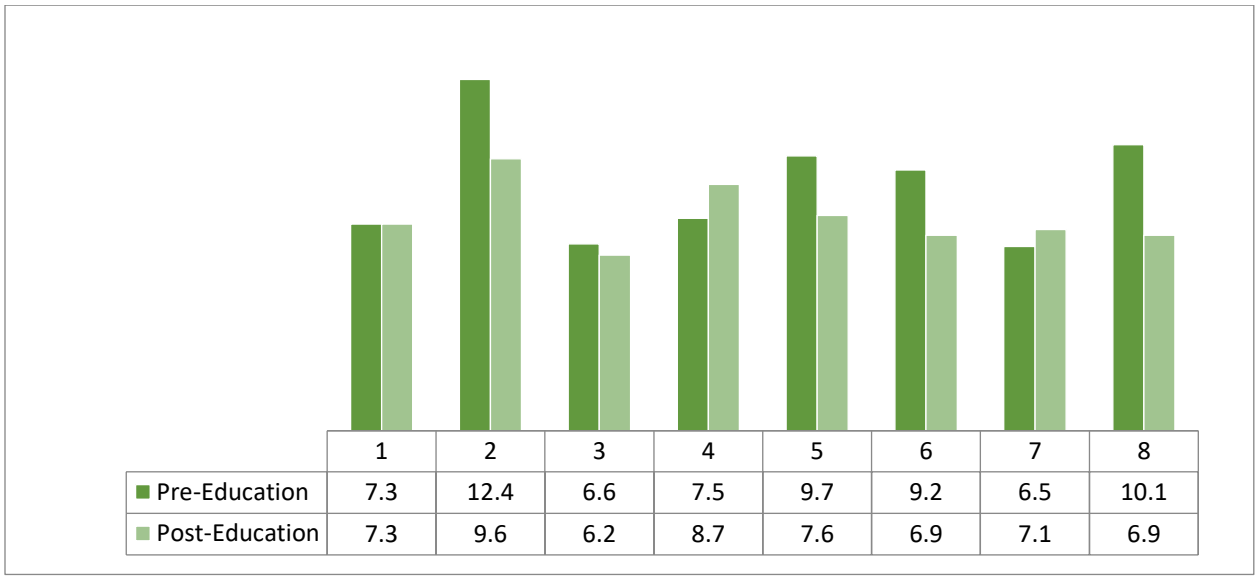
Based on three phases, PET, which stands for Practice Question, Evidence and Translation, it fulfills the needs proposed in this project. The problem-solving approach

makes this an ideal model to deal with poorly controlled blood glucose on insulin-dependent patients.

Results

The average HbA1C of 8 out of 10 patients improved; and two did not have the post-intervention A1C collected. To measure the efficacy of re-education of the injection technique, there were no diet or lifestyle changes that were discussed in this initial implementation.

This project only evaluated short-term goals (3 months), and patients reported feeling more engaged and motivated to perform self-monitoring blood glucose checks, were more compliant and confident with injectable medication administration and fewer mistakes were reported. The average decrease in A1C levels was from 8.7 to 7.5, which is equivalent to 1.2 points reduction in A1C.



	1	2	3	4	5	6	7	8
Pre-Education	7.3	12.4	6.6	7.5	9.7	9.2	6.5	10.1
Post-Education	7.3	9.6	6.2	8.7	7.6	6.9	7.1	6.9

Figure1. Pre and Post intervention HgA1C levels

Cost-Benefit Analysis

Although the lifetime direct medical cost to treat type 2 diabetes is not known, it is estimated that patients with poorly controlled T2DM have a higher annual

average in health care expenditures from $3,430 to $6,680 (Dall et al., 2016). Implementing this educational module in the provider's routine sessions do have a separate cost; the only anticipated cost would be printing materials and a one-time purchase of an injectable pad ($20) and an office provided tablet or laptop, in case multimedia materials are used.

Limitations

This project counted only with a small sample of participants, and for a limited time of only three months. Future studies, if conducted in a wider time frame, should include more participants, and therefore, broader results.

Given most of the patients are dependent on ride arrangements to come to the clinic, it was challenging to arrange separate meetings to do the educational sessions, hence the phone sessions and mailing in the printed materials. Phone meetings were informative, but also limiting in the return demonstration aspect, which could not be conducted with several patients.

If the re-education process is implemented in the routine appointments, there is no anticipated limitation to the intervention to be carried out.

Implications for Clinical Practice

With many insurance companies and medical groups focusing on outcomes, improved numbers are crucial to maintaining provider's reimbursement and continuity of care. With patients having more steady control and improvement of A1C levels, there will be fewer diabetes related complications and fewer hospital admissions, which will translate into higher earning and savings to the company.

Conclusion

There is a gap in knowledge that needs to be addressed regarding insulin or other injectable administration. Many patients have only been educated on the proper techniques when first diagnosed, many years ago. They have forgotten the proper technique or developed habits that hinder proper administration and absorption of the medication. Essential elements of medication administration need to be re-evaluated periodically, especially when A1C goals are not being met. With periodical education on injection techniques and constant lifestyle and eating habits being re-evaluated and enhanced, there is a big chance of improvement in glycemic levels.

Conflicts of Interest

There were no conflicts of interest.

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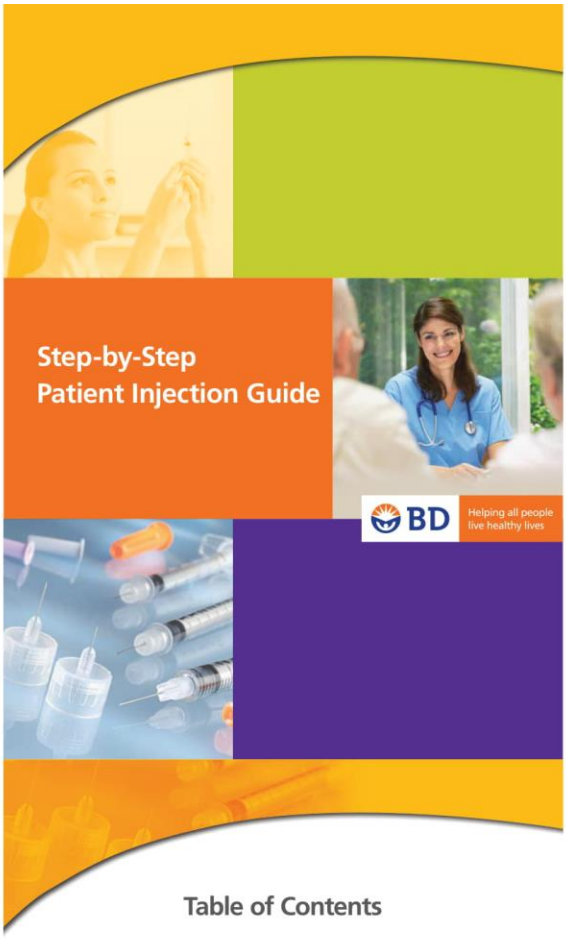
Artifacts

Educational flyer distributed to participan



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Your step-by-step guide to injection.

How your insulin works

Definitions to Review:

Onset of action: The length of time before insulin reaches the bloodstream and starts working.

Peak of action: The time insulin is at its maximum strength or working the hardest to lower blood glucose.

Duration: How long the insulin continues to work in the body.

Basal: Steady and long-acting insulin that works between meals and throughout the night.

Bolus: Rapid burst of insulin that works to match food or lower high blood glucose.

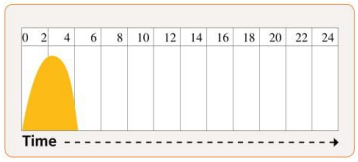
Basal-bolus therapy: Also called "flexible therapy" because it allows for greater flexibility throughout the day. Meals do not have to be eaten at the same time every day and insulin can be taken prior to meals, whenever those meals are scheduled.

How your insulin works

Rapid-acting insulin: Starts to work very quickly, but lasts only a few hours. Injection is usually taken before a meal. This is a type of bolus insulin.

Type of insulin: Humalog®, NovoLog®, Apidra®

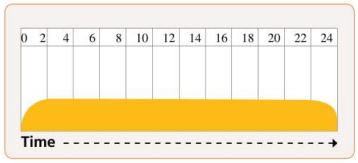
Onset of Action: Within 15 minutes
Peak Action: 1 to 2 hours
Duration: 3 to 4 hours



Long-acting insulin: Provides 24-hour insulin coverage and may be given 1 to 2 times per day. Injection is usually taken before bedtime and/or in the morning. This is a type of basal insulin.

Type of insulin: Lantus®, Levemir®

Onset of Action: 2 to 4 hours
Peak Action: No peak, stable
Duration: 20 to 24 hours



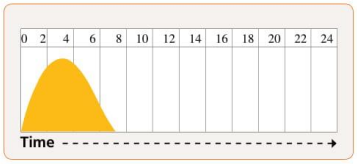
2

How your insulin works

Short-acting insulin: Starts to work quickly, but has a short duration of action. Injection is usually taken with meals. This is a type of bolus insulin.

Type of insulin: Humulin® R, Novolin® R

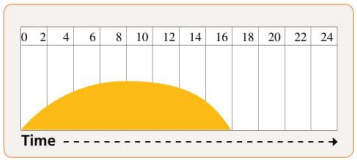
Onset of Action: 1/2 to 1 hour
Peak Action: 2 to 3 hours
Duration: 3 to 6 hours



Intermediate-acting insulin: Works more slowly than regular insulin, but lasts longer. Injection is usually taken 2 times per day (morning and night). This is a type of basal insulin.

Type of insulin: Humulin® N, Novolin® N

Onset of Action: 2 to 4 hours
Peak Action: 4 to 10 hours
Duration: 10 to 16 hours



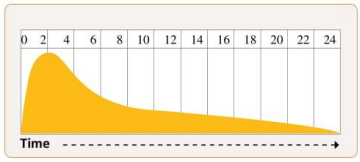
3

How your insulin works

Premixed insulin: Single dose of insulin that combines either rapid-acting or short-acting and intermediate-acting insulin in a fixed ratio. Injection is usually taken 2 times per day (with breakfast and dinner). This is a type of basal-bolus insulin.

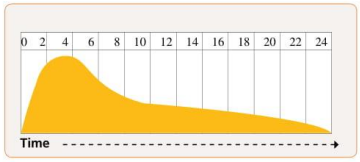
Type of insulin: NovoLog® Mix 70/30, Novolin® Mix 70/30, Humalog® Mix 75/25™, Humulin® Mix 70/30

Onset of Action: Varies
Peak Action: Varies
Duration: Up to 24 hours



Type of insulin: Humalog® Mix 50/50™, Humulin® Mix 50/50

Onset of Action: Varies
Peak Action: Varies
Duration: Up to 24 hours



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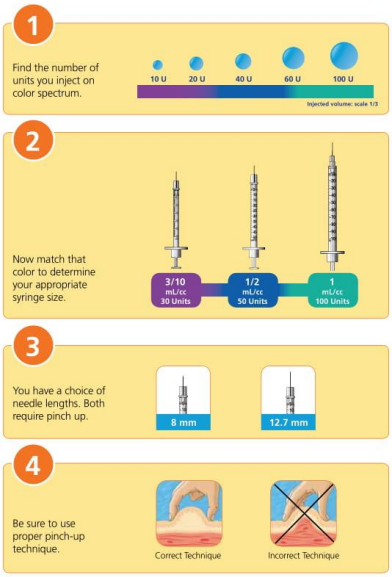
Learning about syringes



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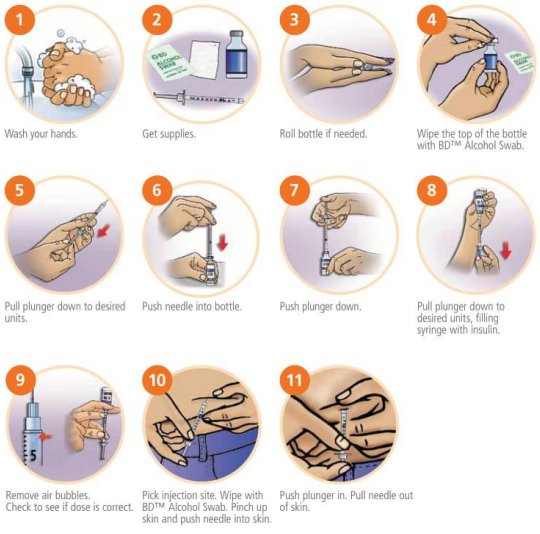
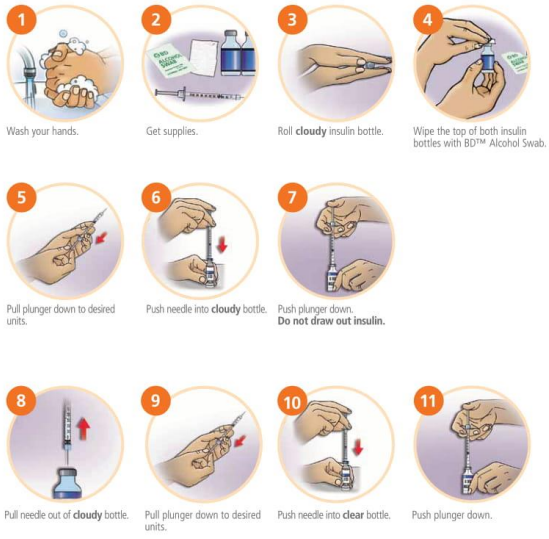
Drawing and injecting one insulin



Mixing, drawing and injecting insulins



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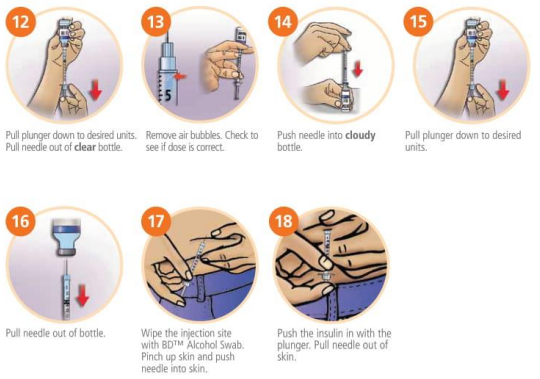
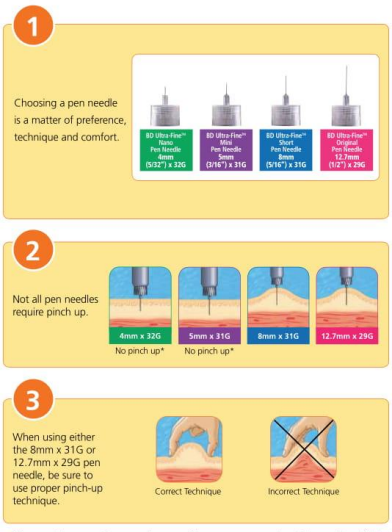
Mixing, drawing and injecting insulins

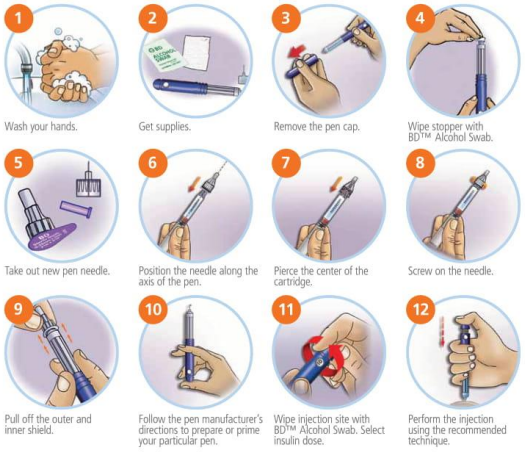


Learning about pen needles



*Some children as well as very thin or muscular teens and young adults, may want to use the pinch up technique if injecting into areas with minimal fat below the skin (i.e. legs, arms, abdomen) to further reduce the risk of intra-muscular injection.

Preparing and injecting with a disposable pen



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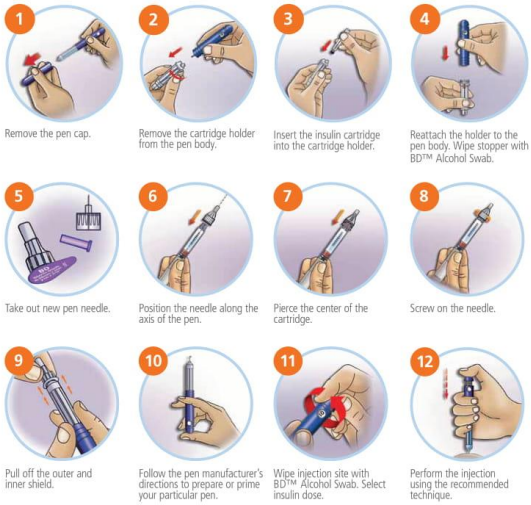
Preparing and injecting with a reuseable pen



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Site selection and rotation

How to rotate sites:

Each new injection should be about a finger's width away from the last injection.

Change sides

Rotate within sites

Injection sites:

Upper Arm, Thigh, Abdomen, Buttocks

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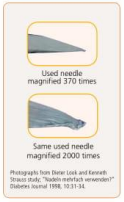
Proper use and disposal

To maintain healthy injection sites, only use syringes or pen needles one time.

Needle reuse contributes to the build-up of scar tissue, which may interfere with insulin absorption. Insulin may not work as expected, if injected into that area.

Please remember that syringes and pen needles are sterile products that are designed for single use only and they are no longer sterile after one use.



Properly dispose of your syringes and pen needles.

After use, the needle should be removed by clipping it off with a BD Safe-Clip™ Needle Clipper and/or placing it into a BD™ Home Sharps Container or into an empty, resealable container.

Needles should be disposed of responsibly without risk to others. Follow local guidelines where applicable.

For more information on state regulations, visit www.BDdiabetes.com/disposal.

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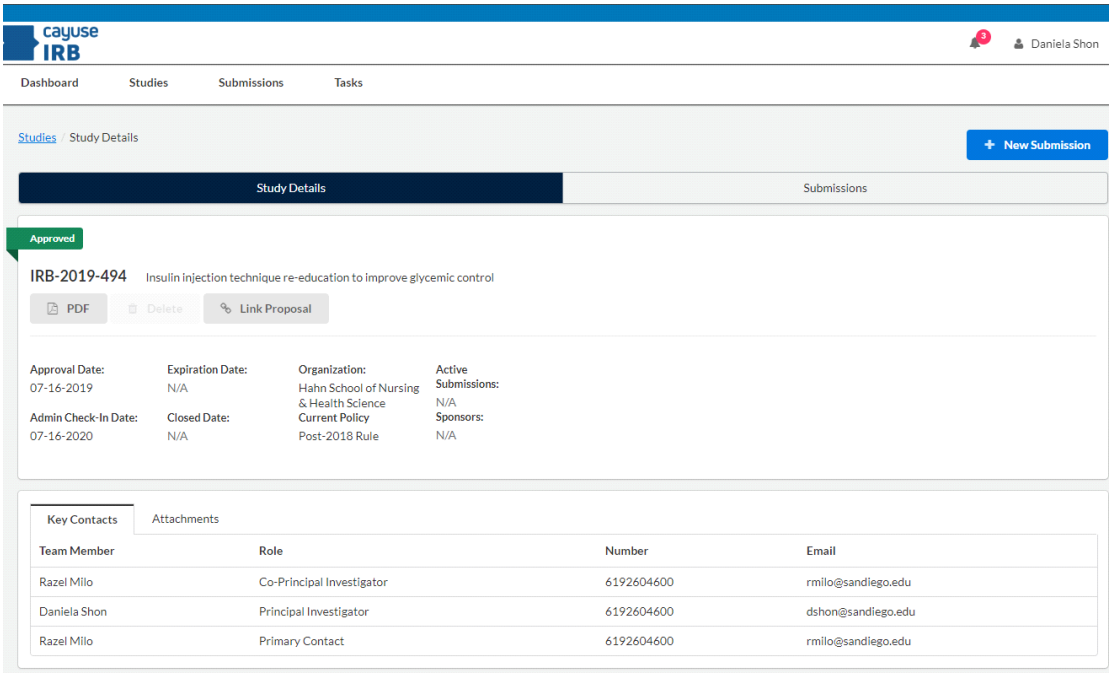
Appendix A

IRB Approval



Appendix B

Letter of Support from Clinical Site

To: Institutional Review Board, University of San Diego

From: Alwin Bagingito MD

Re: Evidence-Based Project

During Fall semester 2018 and Spring semester 2019, Mrs. Daniela Shon spent clinical hours at Alwin Bagingito MD Private Practice as part of her coursework for the Doctor of Nursing Practice (DNP) Program at the University of San Diego.

The project was approved by Alwin Bagingito MD to be conducted at the Alwin Bagingito MD clinic. She can start an evidence-based class project and possible presentations and publications at this site.
The project aims to evaluate the efficacy of injectable medications administration techniques re-education, utilizing multimedia and written materials, as well as one-on-one teaching from the DNP student. Baseline data, such as HgA1C, demographic data, and a knowledge questionnaire and after re-education data will be collected. Patient's real name will not be used. The results of this quality improvement project may be made public and information quoted in professional journals and meetings, but information from this project will only be reported as a group, and not individually.

Subjects will be screened and selected individually, according to appropriateness to the project.

If you have any questions, please do not hesitate to contact me at (951) 695-6787 or awbagingito@verizon.net.

Sincerely,

Alwin Bagingito MD

Appendix C

Poster Abstract with Letter of Acceptance to Conference

Title: Insulin Injection Technique Re-education for Improved Glycemic Control

Background

Patients on insulin therapy often times continue to show suboptimal glycemic control. Data from adult patients with T2DM has shown that 56.1% had poor control, despite adherence to treatment, oral and injectable.

The poor glycemic control stems from many sources, including poor self-efficacy regarding insulin dosage adjustment, inaccurate insulin dosing, expired insulin, lipohypertrophy of injection site and technique and equipment issues.

Purpose

This project aims to implement and assess the efficacy of re-education in the insulin injection technique for improved glycemic control. The study will take place at a family private practice in Temecula, CA.

Methods

Patients will be asked to complete a short survey to evaluate their baseline knowledge. Then, correct answers will be given and the NP student will follow with a 10 minutes re-education instruction session. Follow up by phone will be every other week or monthly, depending on the individual necessities and on as-needed basis. Follow up at the clinic is expected to be within 1 month of implementation.

Latest HbA1C levels will be used as a baseline and then re-measured 3 months after the instruction session was conducted.

Evidence-Based Interventions

Patients will have a re-education session with written, verbal explanation and if permitting, multimedia materials regarding the correct technique of insulin or other injectable medication. Phone follow up every 15 days will be done.

Results

Pre- intervention A1C average was 8.7, and it was dropped to 7.5 at the post-intervention A1C.

Implication for Practice

This simple intervention can lead to patients having the knowledge of resource availability at all times, steady control/improvement of A1C, fewer to no mistakes on injectable administration, fewer diabetes related complications.

Conclusion

There is a knowledge gap among patients self-administering insulin and other injectables; it is essential that healthcare providers are assessing their knowledge and provide refreshers periodically.

CANP 43rd Annual Educational Conference Abstract Inbox ×

Erin Meyer <erin@shawyoderantwih.com> Mon, Sep 16, 2019, 5:30 PM

to

Dear Presenter,

Thank you for submitting an abstract to present a poster at CANP's 43rd Annual Educational Conference taking place March 19-21. 2020 in Riverside. **Congratulations, your poster has been accepted**.

Poster presenters will be assigned a specific presentation time within one of the following time slots:

Thursday, March 19

- 7:45 – 8:15 a.m.
- 10:15 – 11:15 a.m.

Friday, March 20

- 7:30 – 8:15 a.m.
- 10:30 – 11:15 a.m.

Poser presenters are required to register for at least the day of the conference they are presenting. However, we encourage you to register and attend the entire conference. Additional information including specific presentation times will be sent to poster presenters later this month. Please let me know if you have any questions.

Erin Meyer
Events & Education Director
1415 L Street, Suite 1000
Sacramento, CA 95814
916 441-1361
canpweb.org

Power in Practice

Appendix D

Poster Presentation

Insulin Injection Re-Education for Improved Glycemic Control

Daniela Kim Shon DNPc, BSN, RN, PHN
Razel Milo PhD, DNP, MSN, FNP-C, RN

University of San Diego
MAHN SCHOOL OF NURSING AND HEALTH SCIENCE
Betty and Bob Bryden Institute for Nursing Research, Advanced Practice, and Simulation

Background

- Patients on insulin or other injectable therapies many times continue to have suboptimal glycemic control.
- A retrospective analysis has shown that 56.1% of patients had poor glycemic control, despite adherence to therapies, both injectable and oral.
- Poor control can stem from many sources, ranging from unsustainable lifestyle challenges, psychosocial and emotional problems, lack of knowledge regarding injectable therapies.
- References upon request

Evidence for Problem

Poor glucose control HgA1C above 7.5 even with the administration of injectables (insulin, GLP, liraglutide, etc)

Evidence-Based Intervention/Benchmark

- Comprehensive re-education regarding insulin/injectable administration techniques

Objectives

- Recognize the knowledge gap among patients about injectable medications
- Enhance initiative to implement a re-education session on injection dependent patients
- Continuous re-education session on injection dependent patients

Purpose

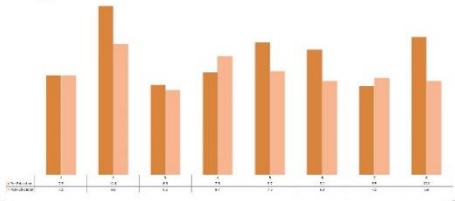
- Re-educate patients in insulin administration, encompassing the correct choice of needle type, the proper use of lifted skin fold where necessary, site rotation, storage and expiration of insulin, and finally, sequence for injecting

Project Plan Process

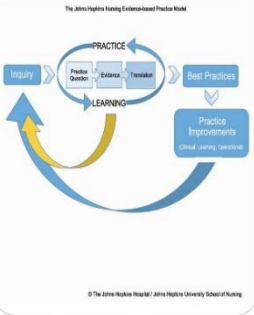
- Identify patients with poor glycemic control despite injectable therapy
- Implement re-education program utilizing written materials and multimedia sources
- Evaluate understanding of materials by return demonstration on an injectable pad
- Bi-weekly phone follow up (up to 15 minutes, by DNP student) to clarify any issues
- HgA1C re-draw in 3 months

Results

- 10 patients participated in the project; Pre data showed the average HgA1C was 8.7
- After the educational implementation, this average dropped to 7.5



Framework/EBP Model



Cost-Benefit Analysis

- Education by provider: $0 cost; education will be provided during office visit follow up during office admin hours
- Printed materials: $20
- Injectable pad: $20
- Laptop/Tablet: $200
- Average of $4,910 savings per T2DM patient

Conclusion

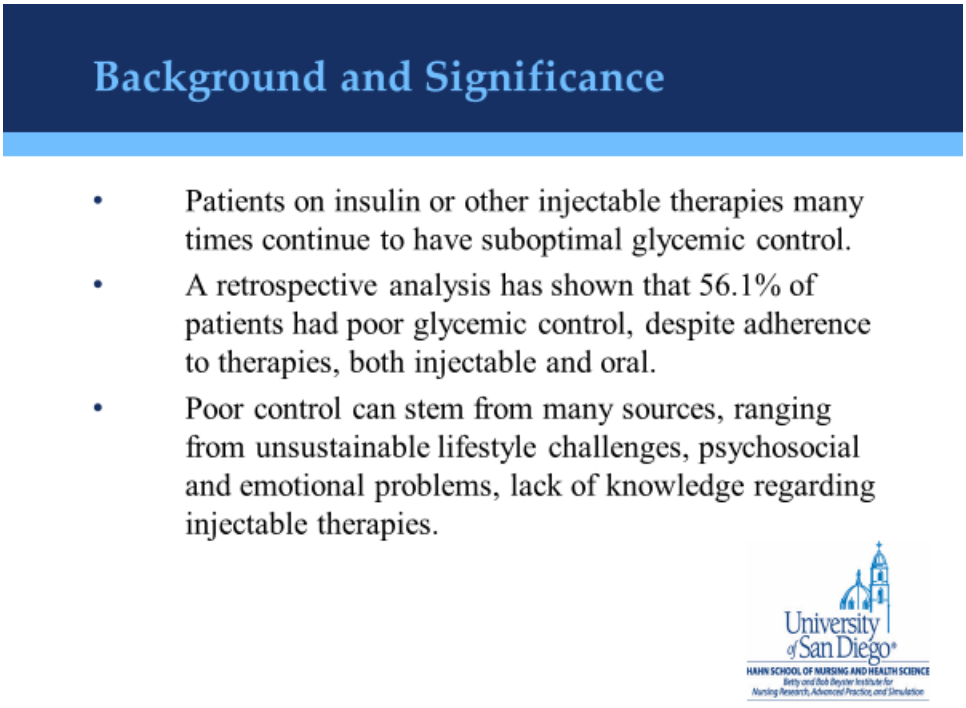
- There is a gap in knowledge that needs to be addressed regarding injectable administration
- Basic elements of medication administration needs to be re-evaluated when goals are not being met

Implications for Clinical Practice

- Patients will have knowledge of resources available at anytime
- Steady control/improvement of HgA1C
- Fewer to no mistakes on injectable administration
- Fewer diabetes related complications
- Fewer hospital admissions

Appendix E

PowerPoint Stakeholder Presentation



Background and Significance

- Patients on insulin or other injectable therapies many times continue to have suboptimal glycemic control.
- A retrospective analysis has shown that 56.1% of patients had poor glycemic control, despite adherence to therapies, both injectable and oral.
- Poor control can stem from many sources, ranging from unsustainable lifestyle challenges, psychosocial and emotional problems, lack of knowledge regarding injectable therapies.

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Purpose/Aims

- Re-educate patients in insulin administration, encompassing the correct choice of needle type, the proper use of lifted skin fold where necessary, site rotation, storage and expiration of insulin, and finally, sequence for injecting

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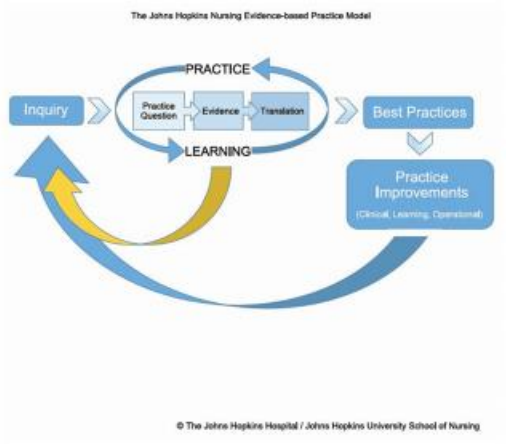
Framework/EBP Model



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Project Plan Process

- Identify patients with poor glycemic control despite injectable therapy
- Implement re-education program utilizing written materials and multimedia sources
- Evaluate understanding of materials by return demonstration on an injectable pad
- Monthly phone follow up (up to 15 minutes, by DNP student) to clarify any issues
- HgA1C re-draw in 3 months

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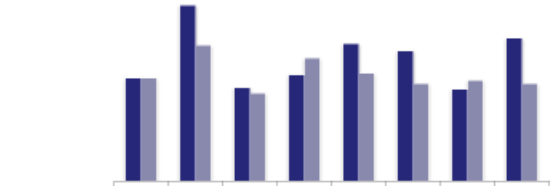
Results

- 10 patients participated in the project; however 2 did not have A1C draws within the stipulated time
- Pre data showed the average HgA1C of 8.7
- After the educational implementation, the average dropped to 7.5, a decrease of 1.2 points



	1	2	3	4	5	6	7	8
Pre-Education	7.3	12.4	6.6	7.5	9.7	9.2	6.5	10.1
Post-Education	7.3	9.6	6.2	8.7	7.6	6.9	7.1	6.9

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Conclusions

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