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The State Of The Science Of Continuous Subcutaneous Insulin Infusion Use By Adolescents and Adults With Type 1 Diabetes

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The State Of The Science Of Continuous Subcutaneous Insulin Infusion Use By Adolescents and Adults With Type 1 Diabetes

Abstract

Background and Significance: Diabetes mellitus is a collection of metabolic diseases, characterized by high blood sugar level, but stemming from different causes (ADA, 2005). The utilization of insulin pump therapy has been increasing over the past number of years in many countries and there currently, there are 20 – 25% of insulin pump users (M. Alsaleh, F., Smith, S. Keady et al., 2009, p. 127). A remarkable decrease in diabetic complications is achievable through close control of blood glucose. Individuals must first meet the criteria for pump utilization which has been established by the American Diabetes Association.

Objectives: to systemically and comprehensively review, analyze and synthesize research on the utilization of continuous subcutaneous insulin infusion (CSII) by adolescents and adults with type 1 diabetes.

Methods: Clearly delineated literature search and inclusion criteria. Literature was reviewed, analyzed and synthesized. The review of current practice standards from the American Diabetes Association was also included. Adolescents and adults with type 1 diabetes on insulin pump therapy were included in this study. Research articles (n = 14) published in the English language and within the past ten years met the inclusion criteria.

Results/Conclusion: Continuous subcutaneous insulin infusion (CSII) is a durable and an effective means of optimizing glycemic control. The ability of CSII to achieve lower blood glucose while simultaneously reducing the rate of severe hypoglycemia is the most significant feature of pump therapy. Study show that intensive insulin therapy with pump is safe and well acceptable by adolescents and adults. Studies indicate that 80% of the adolescents and adults with type 1 diabetes were satisfied with the pump therapy. There are many advantages and disadvantages to pump utilization.

Implications to practice: Insulin pump requires adequate education and supportive measures from health care providers. Prior to pump initiation, providers must take into account the advantages and disadvantages of pump utilization, the patient’s preferences, and the cost of pump therapy.

Limitations: Generalization is limited to adolescents and adults with type 1 diabetes. Majority of the research studies were conducted at a particular clinic and hospital.

Recommendations: Future research should expand the research settings and include different age group using pump therapy. Research should focus the continuous motivation and perhaps long-term complications and expensive from pump therapy.

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Dawn phenomenon: is when the blood glucose levels rise sharply during the early morning hours, in the absence of food intake.

Currently, there are 20 – 25% of insulin pump users. The utilization of insulin pump therapy has been increasing over the past number of years in many countries.

Diabetes mellitus is a collection of metabolic diseases, characterized by high blood sugar level, but stemming from different causes (ADA, 2005).

A remarkable decrease in diabetic complications is achievable through close control of blood glucose level (Y. Wu., M. Graves, & A. Mitchell, 2010).

The utilization of insulin pump therapy has been increasing over the past number of years in many countries.

Currently, there are 20 – 25% of insulin pump users and cost of pumps and associated consumables ranges from $4790 to $5749, depending on the brand and the expected life of six to eighteen years (M. Alsaleh, F. Smith, S. Keady et al., 2009, p. 127).

Criteria for pump use include but are not limited to recurring episodes of hypoglycemia, a hemoglobin A1C greater than 7%, the dawn phenomenon, the inability to gain glucose control levels and, the patient’s preference and acceptance of insulin pumps over conventional injection therapy (ADA, 2005).

Benefits to insulin pump therapy include, but are not limited to, less needles, improved blood sugar control, lowered hemoglobin A1C, increased life expectancy, and long-term complications reductions, increase flexibilities with dietary choices and physical activities, and, it gives the patient more autonomy in their disease management (L. Levitksy & M. Misra, 2013).

Insulin pump also has complications and disadvantages which increases risk of high blood sugar and ketoadiasis, infusion site infection, the cost of the pump, initiation and scarring of the insertion site, weight gain, and the outward appearance of the insulin pumps (G. Morrison & P. Weston, 2013).

Background and Significance

Purpose

To systematically and comprehensively review, analyze and synthesize research on the utilization of continuous subcutaneous insulin infusion (CSII) by adolescents and adults with type 1 diabetes.

Methods

Clearly delineated literature search and inclusion criteria

Systematic review, analysis and synthesis

Review of current standards of practice from the American Diabetes Association

Literature search:

Well-defined, comprehensive search strategy was used

Key words: Insulin pumps and type 1 diabetes, benefits and complications of insulin pumps, adolescents and insulin pumps, adults on insulin pump therapy

Data bases used: CINAHL, MEDLINE, Up-to-date, Pub Med, and Medscape.

Inclusion criteria:

Published in English language

Full-text primary and secondary sources

Outpatient and inpatient setting

Adolescents and adults with type 1 diabetes

Insulin pump therapy

Most common reasons for exclusion:

Not published in English language

Full-text primary source not obtainable and the unavailability of full-text were excluded

Focus not on adolescents and adults with type 1 diabetes on pump therapy

Systematic review, analysis and synthesis:

All citations checked, abstracts reviewed and determined to meet inclusion criteria

Construction and analysis of a Literature Matrix and summaries

Initial focus on reviewing the benefits and complications of pump therapy to daily insulin injections in adolescents and adults with type 1 diabetes

Subsequent focus on synthesizing all studies related to insulin pump therapy by adolescents and adults with type 1 diabetes

Results

Final sample (n =14)

Publications from past 10 years only

No bulk of publications by same authors

Adolescents and adults with type 1 diabetes on insulin pump therapy

Seven of the studies focused on adults with type 1 diabetes using insulin pump , complications and benefits of pump therapy. Four of the studies focused on adolescents with type 1 diabetes using pump therapy, and their lifestyle

Remaining three studies were a combination of adolescents and adults with type 1 diabetes.

Studies included hypothetical, real-life and retrospective cases

Baseline data and analysis of A1C was obtained prior to implementing pump therapy and every 2-3 months thereafter

Conclusions

The studies show that intensive insulin therapy with pump is safe and well acceptable by adolescents and adults

CSII is a durable and effective means of optimizing glycemic control

The ability of CSII to achieve lower blood glucose while simultaneously reducing the rate of severe hypoglycemia is the most significant feature of the pump therapy

Prior to pump utilization, providers should be proactive in helping patients consider the advantages and disadvantages of the pump therapy

Studies indicates that 80% of adolescents and adults with type 1 diabetes were satisfied with the pump therapy

The flexibility in food intake and physical activities is increased with insulin pump utilization

The use of CSII requires patient skills training which has to accompany initiation of pump therapy

Screening of patients for suitability of CSII therapy might be necessary and is recommended by the ADA and the NICE

Limitations related to sample selection:

Generalization is limited to adolescents and adults with type 1 diabetes

Studies have small sample size

Studies were done in a particular clinic or hospital

Four of the studies are international studies

Two of the studies

Implementations to practice

Insulin pump requires adequate education and supportive measures from health care providers

Requires complete screening and selection criteria recommended by the ADA and NICE

Prior to pump initiation, providers must take in account the advantages and disadvantages of pump utilization, the patient’s preferences and the cost of pump therapy

Recommendations for future research

Larger sample size and group

Expand the research settings

References Available Upon Request

Background and Significance

Definitions

CSII: Continuous Subcutaneous insulin Infusion is a device that delivers insulin to the body.

Hemoglobin A1C: is the measure of a blood glucose control over the last two to three months.

Hypoglycemia: Low blood sugar level

Dawn phenomenon: is when the blood glucose levels rise sharply during the early morning hours, in the absence of food intake.