



# Journal of Nursing

Revista de Enfermagem

UFPE On Line

ISSN: 1981-8963

## INTEGRATIVE REVIEW ARTICLE

### CONTINUOUS INFUSION PUMP IN PATIENTS WITH DIABETES MELLITUS: INTEGRATIVE REVIEW

### BOMBA DE INFUSÃO CONTÍNUA EM PACIENTES COM DIABETES MELLITUS: REVISÃO INTEGRATIVA

### BOMBA DE INFUSIÓN CONTINUA EN PACIENTES CON LA DIABETES MELLITUS: REVISIÓN INTEGRADORA

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#### ABSTRACT

**Objective:** to examine the available scientific evidence on continuous subcutaneous pump infusion of insulin for treatment of diabetes mellitus (DM). **Method:** integrative literature review, from the question: What is the production of scientific evidence available on the use of continuous infusion of insulin for treatment of diabetes mellitus? We searched articles through access to databases LILACS, SciELO and MEDLINE using the keywords insulin infusion systems, implantable insulin pump and programmable, diabetes mellitus and infusion pumps. **Results:** 16 papers were selected, discussed in line with the theme. The use of insulin pump comprises a valuable treatment option for diabetic enabling users to achieve glycemic control. **Conclusion:** the use of an infusion pump is important that nursing professionals have dominion over the theme to work with a scientific and not mechanistic. **Descriptors:** Infusion Pumps; Infusion System of Insulin; Diabetes Mellitus; Nursing.

#### RESUMO

**Objetivo:** analisar as evidências científicas disponíveis sobre a bomba de infusão subcutânea contínua de insulina para o tratamento do diabetes mellitus (DM). **Método:** revisão integrativa da literatura, a partir da questão norteadora: Qual a produção de evidências científicas disponíveis sobre o uso da bomba de infusão contínua de insulina para o tratamento do diabetes mellitus? Foram pesquisados artigos mediante o acesso às bases de dados LILACS, MEDLINE e SciELO, utilizando os descritores: *Sistemas de Infusão de Insulina, Bomba de Insulina Implantável e Programável, Diabetes Mellitus e Bombas de Infusão*. **Resultados:** foram selecionados 16 artigos científicos, discutidos em consonância com o tema. O uso da bomba de insulina compreende uma valiosa opção para o tratamento em usuários com DM, viabilizando alcançar o controle glicêmico. **Conclusão:** o uso da bomba de infusão torna-se importante, pois os profissionais de enfermagem precisam apresentar domínio sobre a temática para atuarem com caráter científico e não mecanicista. **Descritores:** Bombas de Infusão; Sistema de Infusão de Insulina; Diabetes Mellitus; Enfermagem.

#### RESUMEN

**Objetivo:** analizar la evidencia científica disponible sobre la bomba de infusión continua subcutánea de insulina para el tratamiento de la diabetes mellitus (DM). **Método:** revisión integradora de la literatura, de la pregunta: ¿Cuál es la producción de la evidencia científica disponible sobre el uso de infusión continua de insulina para el tratamiento de la diabetes mellitus? Se realizaron búsquedas en artículos mediante el acceso a bases de datos LILACS, SciELO y MEDLINE utilizando los sistemas de infusión de insulina palabras clave, bomba de insulina implantable y programable, la diabetes mellitus y las bombas de infusión. **Resultados:** 16 documentos fueron seleccionados, discutidos en consonancia con el tema. El uso de la bomba de insulina comprende una opción de tratamiento para la diabetes permitiendo a los usuarios para conseguir el control glucémico. **Conclusión:** el uso de una bomba de infusión es importante que los profesionales de enfermería han dominio sobre el tema a trabajar con un científico y no mecanicista. **Descritores:** Bombas de Infusión; Sistema de Infusión de Insulina; La Diabetes Mellitus; Enfermería.

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## INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders of multiple etiologies, characterized by hyperglycemia resulting from lack of insulin and / or the inability of its proper share. Due to the increasing incidence and prevalence, acute and chronic complications and consequential costs of care of the users affected with chronic diseases, diabetes is a problem of increasing importance in public health.<sup>1</sup>

Insulin is useful for achieving the therapeutic goal for the blood glucose level and is used in an outline which simulates the physiological secretion of insulin by applying multiple doses or continuous subcutaneous infusion of insulin. Adherence to therapeutic option chosen is conducive to successful treatment and control of disease.<sup>2</sup>

Among the ways of promoting insulinization user with MD, we insulin by continuous subcutaneous infusion pump, which is a mechanical device located outside the body coupled to a device inserted under the skin, which contains an insulin reservoir and batteries as an energy source. Pump users need to develop skills for the appropriate handling of the device as well as getting enough specific knowledge and enabling its use. The responsibility for such guidance is given to a duly qualified health professional.<sup>3</sup>

The nurse, as a professional multidisciplinary team essential in healthcare, scientific support needs to perform competently nursing care to the user with DM in use of infusion pumps, as well as to perform the role of educator facing the user orientation DM in various informations related to the topic.

Thus, he felt the need of this study, which aimed to examine the scientific evidence available on the use of continuous subcutaneous pump infusion of insulin for the treatment of patients with diabetes mellitus in the period from 2000 to 2011, so to contribute to the nurse in decision-making and interventions in health care.

## METHOD

To proceed with the operationalization of this study, we selected the method of integrative literature review with the following research question: "What is the

production of scientific evidence available that contribute scientific basis for nursing care on the use of pump Continuous infusion of insulin for the treatment of patients with diabetes mellitus?"

In this study, we adopted the following sequence of steps: 1) Selecting the guiding question for review, 2) Selection of studies that will compose the sample, 3) Defining the characteristics of the studies, 4) Analysis and interpretation of results; 5) Reporting the review.<sup>4</sup>

The search for studies was the following databases: LILACS - (Latin American and Caribbean Health Sciences), the MEDLINE - (International Literature on Health Sciences) and the library SciELO Brazil - (Scientific Electronic Library Online) the descriptors extracted from DeCS (Descriptors in Health Sciences): Insulin Infusion Systems, Implantable Insulin Pump and Programmable, Diabetes Mellitus and infusion pumps, in English, Portuguese and Spanish.

Were established and the following inclusion criteria: scientific articles available on the Internet indexed in LILACS, SciELO and MEDLINE published between the period 2000 to 2011, in English, Portuguese or Spanish. The exclusion criteria: case reports informal, book chapters, dissertations, theses, reports, news, editorial, not scientific texts, scientific papers without availability of full text online and not consistent with the questioning of the study. It is worth noting that scientific articles repeated in more than one database were counted only once.

After obtaining the search results by the criteria of inclusion and exclusion, held exhaustive reading of scientific papers to verify their suitability due to the research question of the study. The presentation of the sample obtained according to the intersection of descriptors is described in Figure 1.

Crossings	LILACS	MEDLINE	In full online	Scientific Articles	Sample
“Insulin Infusion Systems” AND “Programmable Implantable Insulin Pump” AND “Diabetes Mellitus” AND “Infusion Pumps”	08	525	31	27	15
“Sistemas de Infusão de Insulina” AND “Bomba de Insulina Implantável e Programável” AND “Diabetes Mellitus” AND “Bombas de infusão”	07	196	19	19	0
“Sistemas de Infusión de Insulina” AND “Diabetes Mellitus” AND “Bombas de Infusión”	15	329	23	24	1
Total	30	1050	73	70	16

Figure 1. Sample obtained in the databases LILACS and MEDLINE, Vitoria de Santo Antônio, PE, 2012.

In the databases LILACS, MEDLINE and SciELO descriptors Insulin Infusion Systems, Implantable Insulin Pump and Programmable, Diabetes Mellitus and infusion pumps were placed in the search box and interconnected by connector "AND" to cross, in Portuguese, Spanish and English. Emphasizing that in Spanish the fourth descriptor "Implantable Insulin Pump and Programmable" used at intersections in English and Portuguese listed as synonymous with the descriptor "Insulin Infusion Systems" in the translation into Spanish in DeCS thus in the Spanish language crossing occurred with only three descriptors ("Insulin Infusion System," "Diabetes Mellitus" and "Infusion Pumps").

SciELO database, no result was obtained at the intersection of descriptors in three languages, so any articles from this database composed the study sample.

The crossing of the descriptors in the database LILACS and MEDLINE, resulted in a total of 1080 articles, of which 1050 were from MEDLINE / BVS (Medical Literature Analysis and Retrieval System Online / Virtual Health Library) and 30 from LILACS (Latin American and Caribbean Health Sciences). Online access was unavailable to articles 272 and 735 showed only the abstract is available, for a total of 1007 articles excluded from the sample. Available in full online were 73 papers, of which 4 were excluded because they did not fit as scientific papers, five papers were published for the period prior to 2000, 41 articles by recur-seven flee the theme proposed by guiding question . Thus, the total number of scientific articles found, 16 were selected as part of the study sample, 13 in Portuguese, two in English and one in Spanish, located between the years 2003 to 2010.

The research and analysis of the articles occurred in February 2012. Selected articles were analyzed and checked for their quality by using an instrument previously validated in the literature,<sup>5</sup> both quantitatively and qualitatively considering the following aspects:

1) Professional category and institutions to which the authors belonged

2) Location, year and country of origin research

3) Type of journal in which the articles were published

4) Study design, methodological rigor of the research and publication year of articles

5) Purpose and completion of articles concerning research question.

RESULTS

In this integrative review, analyzed 16 selected articles, where six were authored by physicians and others could not identify the professional category of the authors. Pointed out, however, the organs and entities of which they were part, so that in three articles the authors integrated organs of pediatrics, endocrinology and in four of six diabetes.

Regarding the origin of the articles surveyed, two were conducted in hospitals, seven are literature reviews, and in others not on the study site. Regarding the country of production, four were conducted in Brazil, two in 2006, one in 2007 and one in 2008, five in the United States, one in 2004 and four in 2009, one in France, in 2007, one in Spain, in 2006, one in Cuba, in 2007, one in Italy, in 2009, two in Germany, two in 2009, one in Greece in 2010, and did not identify the country of production, this being in 2003.

Regarding the type of magazine that published articles were included in this review, five were revised in endocrinology, two in the journal Pediatrics, seven in the journal Diabetes, a journal on public health and medical review.

Regarding the research design of scientific articles, the sample proved seven reviews of the literature, a literature review, a case report, four experience reports, two descriptive exploratory study with a quantitative approach and a perspective article. Regarding the level of evidence obtained in 16 articles, met five articles with evidence level two, two articles with a grade five, two with evidence level six one LoE seven.

Didactically, we used Figure 2 for the data presentation of 16 papers selected in this

review, covering all aspects in the following sequence: type of study / year, and goal

completion.

Type of Study / Year	Objective	Conclusion
Literature Review / 2007	Exposing major advances in insulin therapy	You can create therapeutic strategies to stabilize metabolic control, delaying complications and improving quality of life of diabetic patients
Case report / 2008	Presenting the case for diabetic pregnant patient, not controlled with multiple daily injections, whose use the insulin pump resulted in therapy success	Therapy with continuous insulin infusion should be considered as a therapeutic option in the monitoring of pregnant women with type 1 diabetes, being safe even when initiated during this period
Clinical Experience / 2008	Report the first clinical experience with a prototype of implantable artificial beta cell	The term implantable artificial beta cell can be shown, improvements are needed in the structure and insulin delivery system
Review of Literatura/2007	Review the new options in insulin therapy to control diabetes mellitus in children and adolescents	The more widespread use of insulin pump therapy and the introduction of insulin analogs provide more physiological approaches to insulin replacement in children and adolescents with DM1
Descriptive exploratory study with a quantitative approach / 2006	Estimate clinical and economic consequences of the use of continuous infusion of insulin compared to multiple doses through a cost-utility analysis	The improvement in glycemic control of patients with use of infusion pump was associated with a reduction in the overall cost of care for patients with diabetes mellitus type 1, this reduction has a favorable cost-effectiveness ratio compared to conventional treatment with multiple daily doses
Perspective / 2006	Report the consensus of the Brazilian Diabetes Society on the use of insulin infusion pump	There are special groups that might benefit more from the pump, but they are not the majority, those who need intensive treatment might well do it with multiple doses if they were so well cared for, valued and motivated
Literature review / 2006	Reviewing the experiment using the infusion pump for insulin in children and adolescents	The therapy of type 1 diabetes with insulin infusion pump is a safe and effective therapeutic modality, showing better results in metabolic control
Literature Review / 2010	Discuss the latest insulin analogues and its alternative delivery	Individualized treatment plans for the start of insulin administration are critical to achieving blood glucose levels. Progress in these areas and facilitate improved the quality of life of patients
Literature Review / 2009	Report discussion of health experts infusion pump	The insulin pump therapy is beneficial in patients of all ages and security must be ensured carefully
Clinical Experience / 2009	To evaluate the minimum time for which there metabolic changes from the rate of infusion of insulin with the aid of insulin infusion pump	It takes several hours for new metabolic changes are made after the significant change in the level of insulin
Clinical Experience / 2009	Describe the initial clinical experience with a model-based approach to predictive control algorithm used for closed-loop control in type 1 diabetics	Closed-loop control based entirely on subcutaneous glucose sensing and insulin delivery is feasible and can be applied to improve glycemic control in patients with type 1 diabetes, and prevent hypoglycemia during the night
Descriptive exploratory study with a quantitative approach / 2009	Assess satisfaction with treatment and quality of life of users of insulin infusion pump that perform continuous monitoring to those using self-monitoring of blood glucose	Continuous monitoring in real time / infusion pump users gave positive evaluations of all system resources
Clinical Experience / 2009	Adapting the basal rate, based on the current value of glucose obtained with continuous monitoring	The proposed therapy offers the flexibility to account for variations in insulin sensitivity that may result from stress and / or physical activity
Literature review / 2009	Evaluating the evidence for the use of different types of Bolus with use of insulin infusion pump	The recommendation made in most studies has to be accepted with caution until we have better evidence
Literature review / 2003	Clarify the use of insulin pump, its advantages and disadvantages	Pump therapy is a growing option for youth with T1D, where the benefits outweigh the disadvantages
Review of literature / 2004	Exposing hypoglycemic therapies, highlighting the correlation of them with the specific type of diabetes mellitus	Insulin pumps have proven safety and efficacy in a wide variety of patients. The catheters tend to clog the need to change his surgically, is an obstacle

Figure 2. Synthesis of selected papers, 2003-2010. Vitoria de Santo Antão, PE, 2012.

DISCUSSION

Based on the presentation of scientific papers selected for this study, it was possible to identify important issues regarding the use of continuous infusion of insulin in the treatment of patients with diabetes mellitus.

This alternative therapy is inserted

between modern methods, resulting from technological advances that enhance strategies to control glycemic.<sup>6</sup> The broadening of the spectrum of treatment options enables the achievement of better results, due to the variety of user profiles with DM and pathologies associated therewith, reducing and delaying complications, thereby



contributing to a better quality of life.<sup>7</sup>

Effectively, the continuous infusion pump offers safety and comfort to the user with DM because it eliminates multiple needle punctures and reduces complications. In the treatment of children and adolescents with Type 1 diabetes mellitus (DM1), the release is simulated physiological hormonal more similar to the use of continuous infusion of insulin associated with a variety of hormone analogues available than with administration of multiple daily injections (MID). On the other hand, has a higher cost than other treatments.<sup>8</sup>

Despite the cost, the use of insulin pump reduces the overall cost of the service user DM1 by utility and cost-reduction of complications present in lifelong treatment.<sup>9</sup> Even when the MID show closer to the physiological release of insulin in other populations, the use of continuous infusion pump has reduced hypoglycemic episodes, major complication of insulin therapy.<sup>10</sup> The knowledge and therapeutic approaches for the disease and its treatment should be considered in addition to the cost, the availability of material resources that are interesting and accessible to patients in order to promote self-care.<sup>11</sup>

Thus, it is clear that the option of using the device enables individualized treatment for the specific case of each user and may be crucial for obtaining satisfactory glycemic levels. For example, the success of glycemic control that occurred during pregnancy by use of an infusion pump, upon failure of attempts to reset frequent doses administered multiple times. Therefore, the continuous infusion of insulin has revealed not only a safe method to be used in users with DM, but a relevant and decisive therapeutic option for certain clinical challenges. The great advantage pointed to the use of the infusion pump is the flexibility that it offers the user, revealing its high degree of acceptance and enabling adherence to treatment for people with diabetes.<sup>12</sup>

Furthermore, although some barriers to widespread use of the infusion pump, such as the risk of infection at the site of the cannula and the tendency to blockage of the catheters that require annual change by surgical intervention, it is recognized that the benefits outweigh such disadvantages.<sup>13-4</sup>

The accuracy of the release of insulin infusion pump is presented as a security standard for the development of research, which range from a user satisfaction in ongoing monitoring compared to those that perform self-monitoring, by creating an

artificial beta cell according sensing subcutaneous glucose determines the release of insulin by the pump.<sup>15-6</sup>

Somehow, for proper use of the infusion pump, the user DM needs the assistance of health professionals exceptionally well trained and updated on the issue. Therefore, it is vitally important that all nurses, regardless of practice area, know the advantages, disadvantages and characteristics of infusion pump, since users with DM may require attendance at any of the levels assistance offered by the Unified Health System More specifically, the professional nurse should be supported with scientific backrests that will base their interventions with the user with DM in use of infusion pump, especially when exercising their role Educator in Health.

Moreover, only with proper knowledge acquired through a scientific research related to nursing care users with DM in use of continuous infusion of insulin, may be made adjustments, revaluations, adjustments and standards needed by these professionals. Thus, it becomes crucial to producing science involving nursing care to the growing population of patients with diabetes mellitus with use of infusion pump as a treatment option.

## CONCLUSION

The search for evidence on the use of continuous subcutaneous pump infusion of insulin for treatment of patients with diabetes mellitus in the period from 2000 to 2011, contributing to the nursing professionals in the implementation of assistance to users of this therapeutic option, resulted in 16 scientific papers duly reliable criteria for inclusion and exclusion criteria established for this study.

The use of infusion pump advantageously overcoming the disadvantages is growing among users with DM among various age groups and clinical profiles, and, in many cases decisive in the success of reach for glycemic control.

Thus, it is of immeasurable importance that nursing professionals have dominion over the subject, where his performance reveals a scientific care and not simply mechanistic. However, the guidance for decision making towards treatment with DM user in use of continuous infusion of insulin should be guided by monitoring and / or development of scientific research on related topics. Therefore, it is essential that more research focused on the implications of the growth in the use of insulin pump users with diabetes,

those implications that are intertwined with the health activities and involve the professional nurse as a key point in educational process for this therapeutic option.

## REFERENCES

1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes care [Internet]. 2007 [cited 2012 Feb 05];30(Supl 1):42-7. Available from: [http://care.diabetesjournals.org/content/30/suppl\\_1/S42.full.pdf+html](http://care.diabetesjournals.org/content/30/suppl_1/S42.full.pdf+html)
2. Torres HC, Franco LJ, Stradioto MA, Hortale VA, Shall VT. Evaluation of group and individual strategies in a diabetes education program. Rev. saúde pública [Internet]. 2009 [cited 2012 Feb 05];43(2):291-8. Available from: <http://www.scielo.org/pdf/rsp/v43n2/05.pdf>
3. Minicucci WJ. Uso de Bomba de infusão subcutânea de insulina e suas Indicações. Arq. bras endocrinol. metab. [Internet]. 2008 [cited 2012 Feb 5];52(2):340-8. Available from: <http://www.scielo.br/pdf/abem/v52n2/22.pdf>
4. Galvão MC, Sawada NO, Rossi LA. A prática baseada em evidências: considerações teóricas para sua implementação na enfermagem perioperatória. Rev Latino-Am Enfermagem [Internet]. 2002 [cited 2012 Feb 05];10(5):690-5. Available from: <http://www.scielo.br/pdf/rlae/v10n5/v10n5a10.pdf>
5. Ursi ES, Gavão CM. Prevenção de lesão de pele no período perioperatório: revisão integrativa da literatura. Rev Latino-Am Enfermagem [Intenet]. 2006 [cited 2013 Mar 09];14(1):124-31. Available from: <http://www.scielo.br/pdf/rlae/v14n1/v14n1a17>.
6. Espinosa Reyes TME, Madrazo SM. Avances en terapia insulínica en la diabetes mellitus tipo 1: Aciertos y desaciertos. Rev. cuba. endocrinol [Internet]. 2007 [cited 2012 Feb. 05];18(1):0-0. Available from: [http://scielo.sld.cu/scielo.php?script=sci\\_arttext&pid=S1561-29532007000100007&lng=es&nrm=iso&tlng=es#autor&tlng=](http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1561-29532007000100007&lng=es&nrm=iso&tlng=es#autor&tlng=)
7. Schmid, Helena. Novas opções na terapia insulínica. J Pediatr [Internet]. 2007 [cited 2012 Feb 5];83(5):146-54. Available from: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0021-75572007000500005&lang=pt&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0021-75572007000500005&lang=pt&tlng=pt).
8. Liberatore JR., Raphael Del Roio and DAMIANI, Durval. Insulin pump therapy in type 1 diabetes mellitus. J pediatr (Rio J.) [Internet]. 2006 [cited 2012 Feb 5];82(4):249-54. Available from: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0021-75572006000500004&tlng=en](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0021-75572006000500004&tlng=en)
9. Donlo IC, Contreras DS, Barrios JMR, Mizrahi IL, Abat CC, Roze S. Análisis coste-utilidad de las bombas de insulina frente a múltiples dosis diarias en pacientes con diabetes mellitus tipo 1 en España. Rev Esp Salud Publica [Internet]. 2006 [cited 2012 Feb 5];80(6):679-95. Available from: [http://scielo.isciii.es/scielo.php?pid=S1135-57272006000600008&script=sci\\_arttext](http://scielo.isciii.es/scielo.php?pid=S1135-57272006000600008&script=sci_arttext)
10. Valla V. Therapeutics of DiabetesMellitus: Focus on Insulin Analogues and Insulin Pumps. Exp. diabetes res. [Internet]. 2010 [cited 2012 Feb 5];178372. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2877202/pdf/EDR2010-178372.pdf>
11. Barros AE; Souza EN. Self-injection of insulin: attitudes of a group of individuals with diabetes. J Nurs UFPE on line [Internet]. 2011 [cited 2012 Feb 5];5(3):593-603. Available from: [http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/1354/pdf\\_471](http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/1354/pdf_471)
12. Reis JS, Lamounier RN, Menezes PAFC, Calsolari MR, Purisch S. Infusão de insulina subcutânea contínua em gestante com diabetes tipo 1: relato de caso e revisão da literatura. Arq bras endocrinol metab [Internet]. 2008 [cited 2012 Feb 5];52(4):697-700. Available from: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0004-27302008000400017&lang=pt&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0004-27302008000400017&lang=pt&tlng=pt)
13. Torrance T, Franklin V, Greene S. Insulin pumps. Arch Dis Child [Internet]. 2003 [cited 2012 Feb 5];88(11):949-53. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1719341/pdf/v088p00949.pdf>
14. Einhorn D. Advances in Diabetes for the Millennium: Insulin Treatment and Glucose Monitoring. MedGenMed [Internet]. 2004 [cited 2012 Feb 5];6(3 Suppl):8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1474827/?report=printable>
15. Bruttomesso D, Farret A, Costa S, Marescotti MC, Vettore M, Avogaro A, et al. Closed-Loop Artificial Pancreas Using Subcutaneous Glucose Sensing and Insulin Delivery and a Model Predictive Control Algorithm: Preliminary Studies in Padova and Montpellier. J Diabetes Sci and Technol [Internet]. 2009 [cited 2012 Feb.

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05].3(5):1014-21. Available from:  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2769890/pdf/dst-03-1014.pdf>

16. Richard RR. Treatment Satisfaction and Quality of Life for an Integrated Continuous Glucose Monitoring/Insulin Pump System Compared to Self-Monitoring Plus an Insulin Pump. J Diabetes Sci and Technol [Internet]. 2009 [cited 2012 Feb 5];3(6):1402-10. Available from:  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2787041/pdf/dst-03-1402.pdf>

17. Malerbi D, Daniani D, Rassi N, Chacra AR, Niclewicz ED, Silva Filho RL, et al. Posição de consenso da Sociedade Brasileira de Diabetes: insulino terapia intensiva e terapêutica com bombas de insulina. Arq bras endocrinol metab [Internet]. 2006 [cited 2012 Feb 05];50(1):125-35. Available from:  
[http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S000427302006000100018&lang=pt&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S000427302006000100018&lang=pt&tlng=pt)

Submission: 2012/03/23

Accepted: 2013/03/28

Publishing: 2013/05/15

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