PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Information and Communication Technology enabling partnership in person-centred diabetes management: Building a theoretical framework from an inductive case study in the Netherlands
AUTHORS	Wildevuur, Sabine E.; Simonse, Lianne WL; Groenewegen, Peter; Klink, Ab

VERSION 1 - REVIEW

REVIEWER	Gregory P. Forlenza, MD Barbara Davis Center for Type 1 Diabetes University of Colorado Denver Aurora, CO, USA I conduct research sponsored by Medtronic, Dexcom, Abbott, Tandem, Insulet, Type Zero, and Beta Bionics. I have served as a consultant and/or speaker for Medtronic, Dexcom, Abbott, and Tandem.
REVIEW RETURNED	04-Oct-2018

GENERAL COMMENTS	Overall: This very well written manuscript by Wildevuur details a study investigating person-centered diabetes management via development of artificial pancreas technology. The authors take a very detailed and deliberate approach towards outlining key themes for patients and providers in emerging technology for diabetes. They do a very good job of getting into the robust and quickly growing literature on diabetes technology. Please see my comments below regarding updating some of the medical terms around diabetes and directing the authors towards some additional references in the AP field. Major: 1. Please rework the sentence on page 5 L105-110. It should read more like "…patients still suffer from short-term complications such as hypoglycemia ('hypo' for short), hyperglycemia ('hyper') progressing to diabetic ketoacidosis (DKA), and hyperosmolar hyperglycemic syndrome (HHS), and long-term complications…" In the context of diabetes, hypo and hyper are going to refer to the glucose concentration alone, DKA should be used for diabetic ketoacidosis, and HHS should be used for hyperosmolar hyperglycemia syndrome. 2. Pg 5 L114-115: The best reference for the AP algorithms is: Doyle FJ, III, Huyett LM, Lee JB, Zisser HC, Dassau E. Closed-loop artificial pancreas systems: engineering the algorithms. Diabetes Care. 2014;37(5):1191-7. 3. Pg5 L119: The reference for the first generation AP should really be #22 by Bergenstal or Garg 2017 DTT Glucose Outcomes

	with the In-Home Use of a Hybrid Closed-Loop Insulin Delivery System in Adolescents and Adults with Type 1 Diabetes. 4. Pg5 L124: When discussing companies developing AP systems please also look at Forlenza Diabetes Care 2018 Predictive Low-Glucose Suspend Reduces Hypoglycemia in Adults, Adolescents and Children with Type 1 Diabetes in an At-Home Randomized Crossover Study: Results of the PROLOG Trial and Buckingham DTT 2018 Performance of the Omnipod Personalized Model Predictive Control Algorithm with Meal Bolus Challenges in Adults with Type 1 Diabetes. 5. Pg 5 L27: When discussing real-world AP use, please also look at Breton Diabetes Care 2017 Closed-Loop Control During Intense Prolonged Outdoor Exercise in Adolescents with Type 1 Diabetes: The Artificial Pancreas Ski Study. 6. PG5 L131-132: Unfortunately we haven't yet proven that AP can reduce ketoacidosis. This sentence could be changed to "The greatest benefits of the AP are the reduced burden of diabetes management during the day, and improved overnight control of glucose levels thanks to reduced glycemic variability, improved time in target range, and reduced risk of nocturnal hypoglycemia." 7. In the discussion Comparison with other studies section, the authors should look at the manuscript by Tanenbaum and Hood which investigates similar questions: Tanenbaum ML, Iturralde E, Hanes SJ, Suttiratana SC, Ambrosino JM, Ly TT, Maahs DM, Naranjo D, Walders-Abramson N, Weinzimer SA, Buckingham BA, Hood KK. Trust in hybrid closed loop among people with diabetes: Perspectives of experienced system users. Journal of health psychology. 2017. Several of the works by Tanenbaum and Hood may be of interest for cross comparisons in this work.

REVIEWER	Yu Fu University of Leeds, UK
REVIEW RETURNED	16-Oct-2018

GENERAL COMMENTS	It is difficult to read through some of the text as there are numerous grammatical and spelling and tense errors throughout the paper. Also, it doesn't read as an academic paper, more as a report. The reader has to jump between sections looking for information. Therefore proofreading is a necessary action. The aim of this study is to construct a conceptual framework for ICT-enabled partnership towards diabetes management. The biggest problem is there is no conceptual framework developed as a result of this study. Recruitment strategy has its own fault, as there is a bias that participants recruited for this study are users of the ICT that is designed for person-centred care services. This would over-highlight the benefit of using it. Introduction The introduction is too long, however some key information is still missing. No explanation on ICT is given. It's not clear what it is used for and what can offer. Information is missing for patient-professional partnership, how you define it? How you measure it? Would a simply 1-1 consultation be classified as a patient-professional partnership? What is the difference between partnership and relationship? Also, the order of the information in the introduction doesn't work and also shifts away from the focus of this study. Also, more information is needed for the literature in this area, where the gap is and why it is so important to be addressed.

	Methods No methodology is underpinned to guide this study. No ethics reference number is provided. It's not clear about the job of medical specialists and nurses. What do their daily job involve? The interview protocol is not presented, making it difficult to explore whether questions asked were relevant and useful to address the research question. Also, were the interviews conducted in English? Or they have been interpreted? Results Characteristics of the participants are missing. Three themes were developed, however they cannot address the research question. The most important issue is that I cannot see the conceptual framework as the author proposed. Also I am not convinced that the shared data analysing could be a standalone theme just by looking at the quotes. Discussions Comparison with other studies can be embedded into the main text. There is no discussion on how these three themes can help build a conceptual framework. Also the results cannot be transferred as limited people being interviewed, making the reader wonder how the data saturation could was reached. Also, it's not clear from the result of this study that how the partnership supported patients to make decisions. It seemed that health professionals were just there for monitoring the data, but not working together with them for their treatment and care plans. This to me was not patient-professional partnership. There is a need to discuss the implication of practice and research.

REVIEWER	Dr Zoe Franklin Manchester Metropolitan University, United Kingdom
REVIEW RETURNED	15-Nov-2018

GENERAL COMMENTS	Overall, I think this is a very interesting study, in particular with the greater shift towards technology supported care, these types of study are essential to ensure that we understand the needs of our patients. I think you partly addressed your aim to construct a conceptual framework, however I also think that this paper addressed more of the experiences of the patient and healthcare professional in using the AP device. This is an area which I think should be considered throughout the discussion of your findings. You have mentioned in some parts that you've done a single case study design, I think the word single should be removed. A single case study design implies one participant. Although you're investigating one device, the way in which each participant uses the device is very different. I am generally happy with the content of the paper, however I have some specific suggestions which would need to be addressed before I recommend publication. Abstract- The abstract is good, however there is no need to reiterate the aims in the results section. Instead I would take out the first sentence and use the remaining words to explain more of your results and your conclusions. Please can you change the word 'persons' to 'individuals'? Introduction- The introduction includes some essential information, however it doesn't take the reader through to lead to a clear rationale. The first page is quite descriptive and then we are given the study design and the research question, however you then go on to discuss about diabetes and what it means. For a paper as interesting as this I think you need more discussion of the use of

	ICT in healthcare and how it influences patients self-management. You've highlighted some of this information, however, I think restructuring the introduction will make it clearer for the reader. I particular moving lines 87-95 page 4 to the end of the introduction is essential. Method- Overall the method is good and clear. Please include a statement to highlight who ethical approval was given by. Did you check the validity of your data by doing member checking? The Patient involvement statement is ok, however perhaps this could be placed in the participants section? It is not clear why it's there, the information is interesting, however, you haven't clearly defined what they did at the stages of the study. Please expand on this further. Analysis- what version of Nvivo was used, please include this. Figure 2 is slightly grainy- this could be due to the print process. Please ensure it is clear if this goes to publication. Results- the results section is very good and well written. It clearly highlights the main findings and appropriate quotations are given. Discussion- The discussion is written in a similar way to the introduction which makes it difficult to follow. I think the heading comparisons with other findings should be moved to be after the principle findings section. The discussion as it stands jumps around a little bit which makes it hard for the reader to follow. Page 17 line 456-458 this sentence isn't clear and needs rewording. I'm not sure what it is you're trying to explain. Page 17 line 459 should read provides insight into the dynamics of how the… Page 18 line 473, you've said in the discussion you're doing a single case study design, however, this isn't strictly true as you're interviewing multiple participants. See first comments for clarification. I'd like to see more discussion of previous research which has looked at how the patient experience influences the use of devices such as these. How have other conditions utilised technology such as this? Are there any other devices which do something similar? Is there any other app technology such as CGMs that can improve management? How would that fit into something similar to this? CGMs alert the patient to altered insulin levels which are not as good as the AP system, but has any research been done to see what the patient experience might be? I really do like this paper, and find it very interesting. I think making the introduction and discussion stronger will make this an even better paper.

VERSION 1 – AUTHOR RESPONSE

Reviewer:
Reviewer Name: Dr Zoe Franklin
Institution and Country: Manchester Metropolitan University, United Kingdom
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
1) Overall, I think this is a very interesting study, in particular with the greater shift towards technology supported care, these types of study are essential to ensure that we understand the needs of our patients. I think you partly addressed your aim to construct a conceptual framework, however I also think that this paper addressed more of the experiences of the patient and healthcare professional in using the AP device. This is an area which I think should be considered throughout the discussion of your findings. You have mentioned in some parts that you've done a single case study design, I think the word single should be removed. A single case study design implies one participant. Although you're investigating one device, the way in which each participant uses the device is very different. I

am generally happy with the content of the paper, however I have some specific suggestions which would need to be addressed before I recommend publication.

Response: We thank the reviewer for these useful comments. The word ‘single’ has been removed and the study has been referred to more consistently throughout the text as using an inductive case study design. Both the introduction and discussion have been restructured and rewritten. For details, see points 3) and 5) below.

2) Abstract- The abstract is good, however there is no need to reiterate the aims in the results section. Instead I would take out the first sentence and use the remaining words to explain more of your results and your conclusions. Please can you change the word ‘persons’ to ‘individuals’?
Response:
- The first sentence of the results section of the abstract has been taken out;
- The word ‘persons’ has been changed to ‘individuals’;
- To the results section of the abstract we added: “Our data suggests that to enable the partnership through ICT, organisational adjustments need to be made, such as the development of new ICT services and a viable financial model to support these services.”

3) Introduction - The introduction includes some essential information, however it doesn’t take the reader through to lead to a clear rationale. The first page is quite descriptive and then we are given the study design and the research question, however you then go on to discuss about diabetes and what it means. For a paper as interesting as this I think you need more discussion of the use of ICT in healthcare and how it influences patients self-management. You’ve highlighted some of this information, however, I think restructuring the introduction will make it clearer for the reader. I particular moving lines 87-95 page 4 to the end of the introduction is essential.
Response:
- The introduction has been restructured with new paragraph headings to take the reader through to a clear rationale:
Information and communication-enabled person-centred care
Self-management of diabetes
ICT interventions for diabetes management
- The paragraph (former lines 87-95) has been moved to the end of the introduction as suggested by the reviewer, and the text has been revised and now reads (L133-38):

“We chose to employ an inductive case study to focus on the dynamics of the patient-professional partnership shaped through an ICT intervention used in practice for the management of type 1 diabetes, namely an Artificial Pancreas system. The case study was applied to answer the research question: How does ICT enable the partnership between healthcare professional(s) and the patient in chronic disease management?”

- We further revised the text highlighting the definitions of ICT-enabled PCC and the definition of partnership (see track changes in document).

4) Method- Overall the method is good and clear. Please include a statement to highlight who ethical approval was given by. Did you check the validity of your data by doing member checking? The Patient involvement statement is ok, however perhaps this could be placed in the participants’ section? It is not clear why it’s there, the information is interesting, however, you haven’t clearly defined what they did at the stages of the study. Please expand on this further. Analysis- what version of Nvivo was used, please include this. Figure 2 is slightly grainy- this could be due to the print process. Please ensure it is clear if this goes to publication.
Response: Thank you for your suggestions.
- Regarding the ethical approval, we stated on L244-54: “The study was approved by the researchers’ host institute. All participants, prior to the interviews, agreed to participate. Participation was voluntary and participants could withdraw at any point. The research complied with the Helsinki Declaration of the World Medical Association (2013). In our sample design we excluded the participation of vulnerable groups. The topic of our study was not sensitive. The researchers did not use or have access to personal information or datasets; they also neither collected nor used bodily material. All personal information was de-identified. We did not ask participants for private information or experiences. The quotes chosen were sufficiently general to preclude identification of individual participants. The interview protocol was provided in Dutch, and is available upon request.”

- We added a separate patient and public involvement paragraph on L203-12: “The study was designed to understand the prespectives of the participants to gain access to their experiences, feelings and preferences with the use of an AP, of patients diagnosed with type 1 diabetes and others (34). The research question was developed in an iterative manner, and based on patients’ and healthcare professionals’ insights. The AP was chosen as a case study since it was a patient-driven innovation, developed by an engineer who was diagnosed with type 1 diabetes patient himself. Patients were involved in the different phases of the study, and recruited through snow ball sampling, in which participants also supported in recruiting (other) patients.”
- We used Nvivo version 12.2.0; this has been added to the text (L233);
- The researchers have chosen to leave member checking out – even though this may improve the validity of the results – to avoid potential transformation of the data. Instead we checked for reliability in the analysis of the qualitative data by applying the rule of a minimum of 10 quotes per code increasing the internal validity of the data.
- We checked the resolution of all figures and uploaded them again to the system before going to publication stage.

5) Results- the results section is very good and well written. It clearly highlights the main findings and appropriate quotations are given.
Discussion- The discussion is written in a similar way to the introduction which makes it difficult to follow. I think the heading comparisons with other findings should be moved to be after the principle findings section. The discussion as it stands jumps around a little bit which makes it hard for the reader to follow.
Page 17 line 456-458 this sentence isn’t clear and needs rewording. I’m not sure what it is you’re trying to explain.
Response:
The discussion section has been restructured starting with the principle findings, followed by new paragraph headings that makes it easier for the reader to follow (L474-601):

- Principal findings
- Strengths and limitations
- Implications for practice and research

The text has been rewritten accordingly. The paragraph Comparison with other studies has been embedded in the principle findings section.
- The sentence L 484-86 (former 456-458) has been rephrased to: “Our data suggests that to enable the partnership through ICT, organisational adjustments need to be made, such as the development of new ICT services and a viable financial model to support these services.”

6) Page 17 line L459 should read provides insight into the dynamics of how the…
Response: Has been changed as suggested.
Page 18 line 473, you’ve said in the discussion you’re doing a single case study design, however, this isn’t strictly true as you’re interviewing multiple participants. See first comments for clarification.
Response: This has been changed to inductive case study.

7) I’d like to see more discussion of previous research which has looked at how the patient experience influences the use of devices such as these. How have other conditions utilised technology such as this? Are there any other devices which do something similar? Is there any other app technology such as CGMs that can improve management? How would that fit into something similar to this? CGMs alert the patient to altered insulin levels which are not as good as the AP system, but has any research been done to see what the patient experience might be?
I really do like this paper, and find it very interesting. I think making the introduction and discussion stronger will make this an even better paper.
Response: Thank you for this valuable suggestions.
We have rewritten the discussion (L474-598) and added previous research that looked at how the patient experience influences the use of diabetes management devices. We built upon the existing knowledge, such as the study by Tanenbaum et al., (2017), as described on L509: “Over the last years, a growing body of scholarly work has been focusing on the use of (semi-)automated devices for diabetes management (14) (15). The results of, for example, continuous glucose monitoring (CGM) systems and automated insulin delivery systems are promising in showing the benefits for type 1 diabetes by improving glycaemic control through personalized models of predictive control (17) (18). Furthermore, researchers have demonstrated the safety and feasibility of different Artifical Pancreas systems in clinical research settings and more recently in outpatient ‘real-world’ environments (20)

(21). In addition to these feasibility- and efficacy-focused studies on (semi-)automated devices for diabetes management, also the experiences of patients using these type of devices have been studied. A previous study on perspectives of experienced users of hybrid closed loop systems among people with diabetes reported how context-, system-, and person-level factors influenced patients' trust in an AP system (38). Tanenbaum et al. (2017) concluded that when patients lacked trust in the system, they made an attempt to override the system, while trusting the system decreased stress and also decreased self-management burdens, which in our study was described by the participants as carefree living.
Furthermore, a recent study highlighted the findings that acceptance of an AP system depends more on a stronger bond of the users with product characteristics (such as usefulness, complexity, and compatibility) than technology readiness (such as innovativeness, and insecurity) (39). However, the researchers also concluded that the results differed between self-selected and invited persons, so researchers and product developers should be cautious when relying only on self-selected persons in the design, testing and development of AP systems. While the experiences and acceptance of AP systems has been the focus of some studies, further research directions on patient experiences will yield a better understanding what factors influence the acceptance of such automated technology. Our study suggests to take the healthcare professional-patient partnership into account as one of the factors that affect the acceptance and the use of AP systems."

Reviewer:
Reviewer Name: Gregory P. Forlenza, MD
Institution and Country: Barbara Davis Center for Type 1 Diabetes
University of Colorado Denver
Aurora, CO, USA
Please state any competing interests or state 'None declared': I conduct research sponsored by Medtronic, Dexcom, Abbott, Tandem, Insulet, Type Zero, and Beta Bionics. I have served as a consultant and/or speaker for Medtronic, Dexcom, Abbott, and Tandem.

Please leave your comments for the authors below
Overall:
This very well written manuscript by Wildevuur details a study investigating person-centered diabetes management via development of artificial pancreas technology. The authors take a very detailed and deliberate approach towards outlining key themes for patients and providers in emerging technology for diabetes. They do a very good job of getting into the robust and quickly growing literature on diabetes technology. Please see my comments below regarding updating some of the medical terms around diabetes and directing the authors towards some additional references in the AP field.

Thank you very much for the appreciation of our research work and your constructive comments to improve the manuscript.

Major:
Reviewer.
1) Please rework the sentence on page 5 L105-110. It should read more like "…patients still suffer from short-term complications such as hypoglycemia ('hypo' for short), hyperglycemia ('hyper') progressing to diabetic ketoacidosis (DKA), and hyperosmolar hyperglycemic syndrome (HHS), and long-term complications…" In the context of diabetes, hypo and hyper are going to refer to the glucose concentration alone, DKA should be used for diabetic ketoacidosis, and HHS should be used for hyperosmolar hyperglycemia syndrome.
Response: The sentences have been revised as suggested by reviewer to (L102-8): "Even though diabetes management has improved considerably over the years, patients still suffer from short-term complications such as hypoglycaemia ~~diabetic ketoacidosis~~ ('hypo' for short) and ~~hyperosmolar~~ hyperglycaemia ~~state~~ ('hyper') progressing to diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic syndrome (HHS), and long-term complications such as retinopathy, neuropathy, cardiovascular disease, and nephropathy that could lead to complications such as loss of eyesight and amputation".

2) Pg 5 L114-115: The best reference for the AP algorithms is: Doyle FJ, III, Huyett LM, Lee JB, Zisser HC, Dassau E. Closed-loop artificial pancreas systems: engineering the algorithms. Diabetes Care. 2014;37(5):1191-7.

Response: The reference has been replaced by the more recent one of Doyle et al., 2014, and has been added to the reference list (#13).
"Doyle FJ, III, Huyett LM, Lee JB, Zisser HC, Dassau E. Closed-loop artificial pancreas systems: engineering the algorithms. Diabetes Care. 2014;37(5):1191-7 doi: 10.2337/dc13-2108
~~Facchinetti A, Sparacino G, Guerra S, et al. Real-time improvement of continuous glucose monitoring accuracy: the smart sensor concept. Diabetes Care 2013;36(4):793-800. doi:10.2337/dc12-0736.~~

3) Pg5 L119: The reference for the first generation AP should really be #22 by Bergenstal or Garg 2017 DTT Glucose Outcomes with the In-Home Use of a Hybrid Closed-Loop Insulin Delivery System in Adolescents and Adults with Type 1 Diabetes.
Response: The reference (in the revised text now #14) concerning the first generation AP has been replaced by the suggested and more recent: Garg et al., 2017, Garg SK., Weinzimer, SA, Tamborlane, WV, Buckingham, BA, Bode, BW, Bailey, TS, … Anderson, SM (2017). Glucose outcomes with the in-home use of a hybrid closed-loop insulin delivery system in adolescents and adults with type 1 diabetes. Diabetes Technology & Therapeutics, 19(3), 155–163.
~~Hampton T. Fully Automated Artificial pancreas finally within reach. JAMA 2014;311(22):2260–2261. doi:10.1001/jama.2014.6386~~

4) Pg5 L124: When discussing companies developing AP systems please also look at Forlenza Diabetes Care 2018 Predictive Low-Glucose Suspend Reduces Hypoglycemia in Adults, Adolescents and Children with Type 1 Diabetes in an At-Home Randomized Crossover Study: Results of the PROLOG Trial and Buckingham DTT 2018 Performance of the Omnipod Personalized Model Predictive Control Algorithm with Meal Bolus Challenges in Adults with Type 1 Diabetes.
Response: Thanks for the suggestions. We added both studies to the section in which we refer to companies developing AP systems (L119-24), and we completed the reference list with those studies (#17 and #18).

5) Pg 5 L27: When discussing real-world AP use, please also look at Breton Diabetes Care 2017 Closed-Loop Control During Intense Prolonged Outdoor Exercise in Adolescents with Type 1 Diabetes: The Artificial Pancreas Ski Study.
Response: The study of Breton et al., 2017 has been added as reference #21 as a study researching AP systems in the real world.
– Other references have been renumbered in the manuscript and the reference list.

6) PG5 L131-132: Unfortunately, we haven't yet proven that AP can reduce ketoacidosis. This sentence could be changed to: "The greatest benefits of the AP are the reduced burden of diabetes management during the day, and improved overnight control of glucose levels thanks to reduced glycemic variability, improved time in target range, and reduced risk of nocturnal hypoglycemia."
Response: The sentence has been revised by deleting ~~"risk of (nocturnal) hypoglycaemia and ketoacidosis~~" and now reads (L 126-30): "The greatest benefits of the AP are the reduced burden of diabetes management during the day, and improved overnight control of glucose levels thanks to reduced glycaemic variability, improved time in target range, and reduced risk of nocturnal hypoglycaemia."

7) In the discussion Comparison with other studies section, the authors should look at the manuscript by Tanenbaum and Hood which investigates similar questions: Tanenbaum ML, Iturralde E, Hanes SJ, Suttiratana SC, Ambrosino JM, Ly TT, Maahs DM, Naranjo D, Walders-Abramson N, Weinzimer SA, Buckingham BA, Hood. Journal of health psychology. 2017. Several of the works by Tanenbaum and Hood may be of interest for cross comparisons in this work.
Response: Thank you very much for this suggestions. We have included the qualitative study by Tanenbaum et al. (2017), in which they looked into the acceptance of closed loop systems by people with diabetes, and specifically experienced users. In the discussion section we referred to the study as follows (L518-25):
"A previous study on perspectives of experienced users of hybrid closed loop systems among people with diabetes reported how context-, system-, and person-level factors influenced patients' trust in an AP system (38). Tanenbaum et al. (2017) concluded that when patients lacked trust in the system, they made an attempt to override the system, while trusting the system decreased stress and also decreased self-management burdens, which in our study was described by the participants as carefree living."

We also added another study on experiences of an AP system: “Furthermore, a recent study highlighted the findings that acceptance of an AP system depends more on a stronger bond of the users with product characteristics (such as usefulness, complexity, and compatibility) than technology readiness (such as innovativeness, and insecurity) (39). However, the researchers also concluded that the results differed between self-selected and invited persons, so researchers and product developers should be cautious when relying only on self-selected persons in the design, testing and development of AP systems. While the experiences and acceptance of AP systems has been the focus of some studies, further research directions on patient experiences will yield a better understanding what factors influence the acceptance of such automated technology. Our study suggests to take the healthcare professional-patient partnership into account as one of the factors that affect the acceptance and the use of AP systems.”
- To the reference list we added #38: ‘Tanenbaum ML, Iturralde E, Hanes SJ, Suttiratana SC, Ambrosino JM, Ly TT, Maahs DM, Naranjo D, Walders-Abramson N, Weinzimer SA, Buckingham BA, Hood. Journal of health psychology. 2017. doi: 10.1177/1359105317718615.’
Reviewer
Reviewer Name: Yu Fu
Institution and Country: University of Leeds, UK
Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below
Please see the attached document

It is difficult to read through some of the text as there are numerous grammatical and spelling and tense errors throughout the paper. Also, it doesn’t read as an academic paper, more as a report. The reader has to jump between sections looking for information. There for proofreading is a necessary action.
Response: After we made the requested changes and restructured the introduction and the discussion section for the revision of the manuscript, we did a very thorough read through ourselves, and had the text checked and proofread by a professional English line editor.

The aim of this study is to construct a conceptual framework for ICT-enabled partnership towards diabetes management. The biggest problem is there is no conceptual framework developed as a result of this study.
Response: Thank you for noticing that in the discussion section we mention figure 3 instead of figure 2 that shows the conceptual framework, which in some research streams is also called a theoretical framework. Following the inductive case study methodology of Eisenhardt (1989) we have built this emerging theory and theoretical framework with themes and categories from our rigorous qualitative analysis. Based on your suggestion we have changed the term ‘conceptual framework’ to ‘theoretical framework’. L496 of the discussion section is revised to: “The introduction of a new ~~conceptual~~ theoretical framework provides insight into the dynamics of how the partnership between healthcare professionals and persons with a chronic disease is enabled through ICT in chronic disease management of diabetes (see: figure 2 ~~3~~).”
We also revised the caption of Figure 2: ~~Conceptual~~ Theoretical framework of ICT enabling partnership in person-centred diabetes management

Recruitment strategy has its own fault, as there is a bias that participants recruited for this study are users of the ICT that is designed for person-centred care services. This would over-highlight the benefit of using it.
Response: To have access to the emerging knowledge on the use of the ICT that is at the core of our research question, we have chosen to select participants via a combination of purposive and snowball sampling. To provide rich, relevant, and diverse data pertinent to the ICT-enabling of the partnership, we explored perspectives from participants who needed to be familiar with the AP, and the healthcare professionals who worked with the AP in the treatment of their patients, in order to gain access to their experiences, feelings, and worlds (33). Our purposeful recruitment strategy is described under the paragraph ‘Participants’. To overcome confusion we have revised the following sentence L183-4: “... be able to provide rich, relevant, and diverse data pertinent to the ICT-enabling of the partnership (32) (33)”’

Introduction
The introduction is too long, however some key information is still missing. No explanation on ICT is given. It's not clear what it is used for and what can offer. Information is missing for patient-professional partnership, how you define it? How you measure it? Would a simply 1-1 consultation be classified as a patient-professional partnership? What is the difference between partnership and relationship?

Response:
- We shortened the text on diabetes management in the introduction, and we restructured the introduction section with paragraph headings
- Based on your suggestion, we explained more clearly in the introduction what ICT is used for (L77-97). We described and defined the patient-professional partnership (L71-77) in line with reference #1 and #3;
- The difference between a relationship and partnership is that the former is the medium of partnership. To avoid mixing up the two terms, we changed the term relationship to partnership to be consistent throughout the whole manuscript;
- A paragraph on ICT enabling of PCC has been restructured (L82-97).

Methods
No methodology is underpinned to guide this study.
Response: Thank you for noticing that reference 12, which underpins our methodology, comes too late for the reader in the analysis paragraph and the discussion section. We revised the referencing in the Methods section to better underline the methodology choices with references #9, #27, #32, #33, #35, #35, #36, #37, #40, #41 and # 42.
No ethics reference number is provided.
Response: We followed the research ethics regulations of the researchers' host institute in the Netherlands regarding the ethical approval and consent, in which no ethics reference number was required. To describe the ethical part in more detail, we provided additional information (L244) under the heading ethical considerations: "The study was approved by the researchers' host institute. All participants, prior to the interviews, agreed to participate. Participation was voluntary and participants could withdraw at any point. The research complied with the Helsinki Declaration of the World Medical Association (2013). In our sample design we excluded the participation of vulnerable groups. The topic of our study was not sensitive. The researchers did not use or have access to personal information or datasets; they also neither collected nor used bodily material. All personal information was de-identified. We did not ask participants for private information or experiences. The quotes chosen were sufficiently general to preclude identification of individual participants. The interview protocol was provided in Dutch, and is available upon request."

It's not clear about the job of medical specialists and nurses. What do their daily job involve?
Response: The jobs of the medical specialists are: paediatrician-endocrinologist and internist-endocrinologist sections. The nurses are specialised diabetes nurses. This has been indicated on L194-95.

The interview protocol is not presented, making it difficult to explore whether questions asked were relevant and useful to address the research question. Also, were the interviews conducted in English? Or they have been interpreted?
Response:
- Since the AP was developed and tested in the Netherlands, all participants were Dutch, and all the interviews were held in Dutch. The interview protocol was also in Dutch. The Dutch interview protocol outline is available upon request, as we added in the manuscript on L253;
- The interviews were transcribed in the spoken language, Dutch, and analysed. The quotes chosen to be used in the text were translated from Dutch to English, checked with the original text and edited by a native speaker.

Results
Characteristics of the participants are missing. Three themes were developed, however they cannot address the research question. The most important issue is that I cannot see the conceptual framework as the author proposed. Also I am not convinced that the shared data analysing could be a standalone theme just by looking at the quotes.
Response:

- Characteristics of the participants have been added (see under 3. of the response under the Methods section);
- Figure 2 shows the theoretical framework. Following the inductive case study methodology of Eisenhardt (1989) we have built this emerging theory with themes and categories that we have found from our rigorous qualitative analysis. The themes have been systematically developed, as described under the Study Design section, leading to the theoretical framework as graphically shown in figure 2 and explained on L229 under Analysis: "we used thematic analysis to identify patterns within the data, and grouped them under codes, categories, and themes, whereby we particularly sought to identify how ICT supported the partnership in diabetic/chronic disease management. The first two authors analysed the data in an iterative process of coding and use of NVivo software, version 12.2.0. We started with a line-by-line coding that was derived from the research question. We processed the coding by reading and analysing the data – in which we preserved (inter-)actions by using as many gerunds ('ing') as possible. The first and second author reviewed the codes. After that, through focussed coding, we organised and grouped the coded data that shared characteristics into categories."
- The quotes are evidence quotes, representing similar coded quotes, shown in brackets. Groups with less than ten quotes have been left out by the researchers, leaving only the groups with a more robust number of quotes, one of which was shared data analysing.

Discussions
Comparison with other studies can be embedded into the main text. There is no discussion on how these three themes can help build a conceptual framework. Also the results cannot be transferred as limited people being interviewed, making the reader wonder how the data saturation could was reached. Also, it's not clear from the result of this study that how the partnership supported patients to make decisions. It seemed that health professionals were just there for monitoring the data, but not working together with them for their treatment and care plans. This to me was not patient-professional partnership. There is a need to discuss the implication of practice and research.
Response: We restructured the discussion section and revised the text to explain more clearly the contribution of our findings and how it corresponds to other studies.
- Comparison with other studies was embedded in the main text of the Discussion. Based on the comments, the Discussion was rewritten to explain the theoretical framework development under principal findings:
L498- "The introduction of a new theoretical framework, provides insight into the dynamics of how the partnership between healthcare professionals and persons with a chronic disease is enabled through ICT in chronic disease management of diabetes (see: figure 2). The three themes entail reordering the partnership between the person with diabetes, the internist, the diabetic nurse and the intelligent device professional. Thus the partnership interaction between healthcare professionals and persons with a chronic condition simultaneously changes the partnership, strengthens the interests of the patient (self-management), and yields precise data on the clinical phenomenon."

- Under Strengths and limitations we added a sentence (L552-558) on the limited number of people being interviewed. "We also acknowledge limitations of the study. Our findings should be considered in the context of our study design. One of the inclusion criteria to participate in the study was experience with an AP system. This system was tested as part of a separate trial during which the participants were closely monitored by clinical researchers. The use of the system was reduced to a relatively short duration. Therefore, the results may not be generalised to other AP systems or to long term use of the system on a larger scale."

- To discuss the implications for practice and research we added a separate section (L568-). "In order for ICT to take over the burden of self-managing disease through shared analysis of (medical) data, it is necessary to embed ICT services and professionals into the healthcare organisation. The introduction of ICT introduces new demands on healthcare professionals and patients, influencing how the partnership is experienced.
In addition, when introducing ICT in a healthcare context, the technology should be studied as part of a dynamic and networked healthcare environment, so-called 'fourth generation studies' (43), and should take a participatory development approach to guide the development, implementation and evaluation of eHealth technologies and interventions (44). Our study suggests that these types of studies should also include a focus on the partnership and how this is reshaped by the introduction of ICT. The results of our study show that to support the partnership in a sustainable manner, ICT needs

to be embedded in healthcare organisations. As a result, the care pathways also need to be redesigned so we can move towards person-centred chronic disease management, offering treatment 'when needed, where needed' based on the availability of rich data generated by an ICT system. Previous research has pointed to the fact that human connectedness provides the necessary conditions for communication and cooperation on which formal relations of partnership can be constructed (1, 3). Our study shows that introducing an ICT-enabled PCC solution structures an integrated form of professional-patient connectedness. The self-management of the disease, but also the analysis of (medical) data and the experience of the partnership, shift the focus of the professional-patient connectedness from the medical specialist to the diabetic nurse. New roles take shape, such as the one of the intelligent device professional, and a different network will (have to) evolve around the patient. One of the lessons could be that it becomes more important to look at the personal progression of the disease in addition to following the existing rigid care pathways.
The expected changes in the role of healthcare professionals as a result of introducing ICT-enabled PCC towards chronic disease self-management must be addressed with the design of a new care model integrating the changing partnership. The next steps should be to study how to design care models that fit these changes in the partnership as a result of ICT-enabled PCC, and how a sustainable financial model should be determined for ICT-enabled person-centred chronic disease management."

VERSION 2 – REVIEW

REVIEWER	Gregory P. Forlenza, MD Barbara Davis Center University of Colorado Denver USA I conduct research sponsored by Medtronic, Dexcom, Abbott, Tandem, and Insulet. I have been a speaker/advisory board member for Medtronic, Dexcom, and Tandem.
REVIEW RETURNED	12-Mar-2019

GENERAL COMMENTS	Overall: This very well written manuscript by Wildevuur investigates aspects of the provider-patient relationship in the newly evolving era of artificial pancreas therapy for T1D. The manuscript is very well written with appropriate details for rationale, study design, results, and discussion of results. The authors were very thorough in identifying similar works by other groups against which to compare their findings. I have several comments related to AP systems and the current state of this field of research which should be considered by the authors. Major: 1. Pg 5 L116: It would be more accurate to say that the artificial pancreas referenced (the 670G) aims to control blood glucose around a target of 120 mg/dL. The authors are right that 70-180 mg/dL is the range we use to assess control, but the ePID 3.0 algorithm operating in this system manages to a target not a range, and the target is hard-coded at 120 mg/dL. You may also want to include the mmol/L values (120 mg/dL=6.7 mmol/L, 70 mg/dL=3.9 mmol/L, 180 mg/dL = 10 mmol/L) for the European audiences. 2. Pg 5 L119-121: The statement that we are developing AP systems to completely take over insulin and glucagon delivery is inaccurate. Most of the studies cited are about developing AP systems to automatically regulate basal insulin delivery but would still require user entry of carbohydrate intake (hybrid closed loop systems). Several groups (e.g. Damiano in Boston and Jacobs in

	Oregon) are also developing dual-hormone systems, but these systems would need to operate in insulin-only modes as well. Groups are also working on systems which would not require user-entry of carbohydrates (fully closed loop systems), though none are currently past safety studies. 3. Pg 5 L125: There have actually been several meta-analyses looking at AP performance across different studies. The Bekiari study you cite as well as Weisman 2017 from Lancet Diabetes Endocrinology and Dai 2018 from Diabetes Therapy. The Hovorka group came out with an additional review written by Boughton in Diabetic Medicine in 2018 which could also be included. 4. Methods sections 2-3: The settings and case description labels are inaccurate. The authors should rewrite this as a Device Characteristics section getting into some of the relevant details of the AP system under study. The references to the prior studies on the control strategy are helpful. Specifically it would be beneficial to know: What CGM provides the glycemic input? What pump or pumps were delivering the insulin and glucagon? Was the controller housed on the pump or on a cell phone? These features likely play a large role in the patient's experience with the system and are important to interpreting their observations in context. It may be best to just highlight that the system has been described in detail by Blauw and the PCDIAB consortium and cite the 2016 Diab, Obestity, Metabolism article much earlier in this article. I've written summaries of the Inreda Diabetic BV system's studies, but it took me quite a bit of digging in this article to understand that this was the system patients were using.

VERSION 2 – AUTHOR RESPONSE

Reviewer:

Gregory P. Forlenza, MD

Barbara Davis Center

University of Colorado Denver

USA

Please state any competing interests or state 'None declared':

I conduct research sponsored by Medtronic, Dexcom, Abbott, Tandem, and Insulet. I have been a speaker/advisory board member for Medtronic, Dexcom, and Tandem.

Overall:

Reviewer: This very well written manuscript by Wildevuur investigates aspects of the provider-patient relationship in the newly evolving era of artificial pancreas therapy for T1D. The manuscript is very well written with appropriate details for rationale, study design, results, and discussion of results. The authors were very thorough in identifying similar works by other groups against which to compare

their findings. I have several comments related to AP systems and the current state of this field of research which should be considered by the authors.

Response: We thank the reviewer for his useful comments. We considered these, and made changes to the manuscript accordingly, which we explain in detail below.

Major:

1. Pg 5 L116: It would be more accurate to say that the artificial pancreas referenced (the 670G) aims to control blood glucose around a target of 120 mg/dL. The authors are right that 70-180 mg/dL is the range we use to assess control, but the ePID 3.0 algorithm operating in this system manages to a target not a range, and the target is hard-coded at 120 mg/dL. You may also want to include the mmol/L values (120 mg/dL=6.7 mmol/L, 70 mg/dL=3.9 mmol/L, 180 mg/dL = 10 mmol/L) for the European audiences.

Response: The range is changed into target, as suggested, and we included the target value, also for the European audience. The tekst now reads (pg 5 L115-116): "…aims to control blood glucose around a target of 120 mg/dL (=6.7 mmol/L) (14)."

2. Pg 5 L119-121: The statement that we are developing AP systems to completely take over insulin and glucagon delivery is inaccurate. Most of the studies cited are about developing AP systems to automatically regulate basal insulin delivery but would still require user entry of carbohydrate intake (hybrid closed loop systems). Several groups (e.g. Damiano in Boston and Jacobs in Oregon) are also developing dual-hormone systems, but these systems would need to operate in insulin-only modes as well. Groups are also working on systems which would not require user-entry of carbohydrates (fully closed loop systems), though none are currently past safety studies.

Response: Thanks for this comments. We adapted this part of the text, and changed it into (pg 5 line 119-121): "Several companies worldwide are developing AP systems to regulate basal insulin delivery, by taking over the regulation of the glucose levels through automating insulin – and still in an experimental phase, also glucagon - delivery (15) (16) (17) (18)."

3. Pg 5 L125: There have actually been several meta-analyses looking at AP performance across different studies. The Bekiari study you cite as well as Weisman 2017 from Lancet Diabetes Endocrinology and Dai 2018 from Diabetes Therapy. The Hovorka group came out with an additional review written by Boughton in Diabetic Medicine in 2018 which could also be included.

Response: We complemented the studies as suggested, and added the references as follows:

23. Boughton CK, & Hovorka R. Is an artificial pancreas (closed-loop system) for Type 1 diabetes effective? Diabetic Medicine 2019;36(3):279–86.

24. Dai X, Luo Z, Zhai L, Zhao W, & Huang F. Artificial Pancreas as an Effective and Safe Alternative in Patients with Type 1 Diabetes Mellitus: A Systematic Review and Meta-Analysis. Diabetes Therapy 2018;9(3):1269–77. doi:10.1007/s13300-018-0436-y

25. Weisman A, Bai J-W, Cardinez M, Kramer CK, & Perkins BA. Effect of artificial pancreas systems on glycaemic control in patients with type 1 diabetes: a systematic review and meta-analysis of outpatient randomised controlled trials. The Lancet Diabetes & Endocrinology 2017;5(7):501–12.

4. Methods sections 2-3: The settings and case description labels are inaccurate. The authors should rewrite this as a Device Characteristics section getting into some of the relevant details of the AP system under study. The references to the prior studies on the control strategy are helpful. Specifically it would be beneficial to know: What CGM provides the glycemic input? What pump or pumps were delivering the insulin and glucagon? Was the controller housed on the pump or on a cell phone? These features likely play a large role in the patient's experience with the system and are important to interpreting their observations in context. It may be best to just highlight that the system has been described in detail by Blauw and the PCDIAB consortium and cite the 2016 Diab, Obestity, Metabolism article much earlier in this article. I've written summaries of the Inreda Diabetic BV system's studies, but it took me quite a bit of digging in this article to understand that this was the system patients were using.

Response: We rewrote this part of the text, based on the reviewer's comments. As suggested by the reviewer, we highlighted the described AP-system by referring to the detailed study of Blauw and the PCDIAB research consortium of the AP-system, we have been studying. There for, the text now reads (pg 7 L 163-165): "The AP system has been described in more detail by Blauw and the research group Portable bihormonal Closed Loop for Diabetes (PCDIAB) (31)."