ORIGINAL ARTICLES

Facilitating and inhibiting factors to implement telemonitoring: A qualitative study

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ABSTRACT

Objective: Despite the added value of telemonitoring (TM) in the management of chronic care, widespread implementation and continuation is failing. The aim of this qualitative study was to explore the facilitators and inhibitors for successful implementation among field experts and health care providers in the projects of TM in primary care.
Methods: An exploratory qualitative design using semi-structured interviews with field experts of TM projects in Belgium.
Results: The eight interviewees reported an overall positive perception on the actual use of TM. They emphasized that TM provides a promising approach to the ageing population with an increasing burden of chronic diseases. TM was said to increase disease awareness in patients with chronic heart failure. The interviewees were willing to use the new technology. Sharing patient data between health care professionals optimizes care continuity and transmural collaboration, with the focus on problem detection. However, TM in their projects was perceived as an additional task as it was not embedded in regular care. Coordination of care using TM was felt to be incomplete. Agreements on tasks and responsibilities in sharing patient data were unclear. The management and centralisation of data was difficult and impeded implementation in regular care. Furthermore, the interviewees noted that sustainability of their efforts was hampered as the projects would not be financed in the future.
Conclusions: Field experts of pilot TM projects believe in benefits of TM and the willingness of health care providers to use the technology. To successfully implement TM in regular care the reported barriers need to be considered. Transmural collaboration with interaction and involvement of the chronic patient and a proactive team of care professionals is required. Efforts should be made to integrate TM in regular care, both structurally and financially.

Key Words: Primary health care, Patient-centred care, Telemonitoring, Heart failure, Implementation

1. INTRODUCTION

The higher life expectancy of the European population implies more emphasis on living with chronic diseases.[1,2] To date, people over 65 represent 17.4% of the EU (2010) but they will account for 29.5% by 2060.[3,4] Chronic diseases have the biggest contribution to the total burden of disease and mortality in Europe.[2] Worldwide more than 36 million people died from chronic diseases in 2008.[4]

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These socio-demographic changes challenge health care systems. Increased numbers of chronically ill patients force health care systems towards a fundamental change in the process of care. In Europe, many countries face shortages of nurses and general practitioners, due to the shrinking ratios of health care providers per patient and the increasing amount of tasks. In the scope of these rising demands for chronic care and the pressure of budgets, more efficient means of medical care are needed, especially in conditions with multimorbidity.[5] Many health systems have expressed their interest to improve and enforce primary health care.[4,6]

Efforts to improve efficiency and quality of care in primary health care may result in a decrease in acute hospitalization and long-term institutionalization and keep individuals longer in their own community.[6] Telemonitoring (TM) is a telemedicine application in which physiological and biological data are transferred intermittently from the patients' home to the geographically distant TM centre to observe patients, store and interpret data and support clinical decision-making of professionals.[7] Parameters, such as heart rate, blood pressure, weight, electrocardiographic measurements and oxygen saturation, can be transferred by telephone or by a wireless connection.[8]

Worldwide there is growing interest in the added value of TM in the treatment and follow up of chronic diseases.[9] Many reviews have focused on the clinical outcomes and benefits of TM in the management of chronic diseases.[8,10,11] TM was related to a decrease in hospital readmissions and an increase in quality of life.[7,8,12] Inglis *et al.* (2010) describes a 34% reduction in risk of all-cause mortality and a 9% reduction of all cause hospitalization compared to usual care. Three out of 7 studies in the same review reported statistically significant improvement in quality of life outcomes.[8] However, implementation of new technology is not always easy.[13,14] Beside the use of new tools, TM implies changes in organizational and patient related aspects.[14] Embedding TM in usual care is found to be difficult to achieve.

There is a lack of research that describes the success factors for widespread implementation of TM after the pilot research projects phase[15–18] in terms of (1) attitudes of health professionals towards TM (2) factors influencing rapid implementation of TM and (3) staff acceptance in the use of telehealth technologies in primary care.[16] Besides, little research was conducted on the identification of specific barriers for implementation of TM in patients with chronic diseases. Chronic heart failure (CHF) has a significant share worldwide in chronic disease.[4] Boyne *et al.* (2013) grouped the barriers for implementation of TM in patients with CHF according to the perceived attributes of innovation by Rogers. This theory explains the rate of adoption of an innovation by five attributes of innovation. Inhibiting and facilitating factors from intramural practice were not explored.[18]

Fairbrother *et al.* conducted a qualitative study to explore the views of patients and professionals on acceptation of TM and concluded TM as useful in the management of chronic heart failure, although with some caveats. The need for improved technology and changes to service provision in order to better meet the intended objectives of the service was acknowledged within this research. Although this information is valuable, data in this study was collected from only one project.[19] In Flanders (Belgium), five TM pilot projects in the scope of chronic heart failure were funded by the Flemish and the Federal government. In former research we detected that none of the projects had prospects for continuation after the pilot phase.[20] It was suggested that more research is needed to describe and analyse the inhibiting and facilitating factors for using TM devices within daily practice.

The aim of this qualitative study was to explore the facilitators and inhibitors for successful implementation among field experts and health care providers in the projects of TM in primary care.

2. METHODS

An explorative qualitative study using semi-structured interviews with field experts of TM projects.

2.1 Setting

This study, conducted in Belgium, builds on previous research that described specific features of TM projects.[20] We contacted the managers of these five pilot projects and examined the operational processes of the projects by using structured telephone and face-to-face interviews. The managers proposed field experts working in these pilot projects, with (1) experience in the use of TM in daily practice or TM technology and (2) working with CHF patients. A heterogeneous sample of three male and five female field expert volunteers was selected making sure that at least one health care professional from each project was included (see Table 1).

Semi-structured interviews were undertaken to discuss the personal experience and opinions within the pilot project. The goal was to perform an in depth analysis of their attitudes based on their real life experiences.

2.2 Data collection and data analysis

Data collection was organized in the final trimester of 2012, using face to face semi structured interviews. An interview guide was made based on an exploratory literature search and consisted of five categories of open-ended questions related to facilitating or inhibiting factors: (1) patient-related factors,

(2) health-care professional-related factors, (3) financial and legal issues, (4) educational topics and (5) collaboration (see Table 2).[2] A topic list, at the end of each interview, was used to ensure all related topics had been dealt. Each interview took one hour maximum. The respondents were free to choose the location of the interviews.

Table 1. Profession of the respondents

Profession (n = 8)	Working field
Nurse (4)	
Primary care (1)	Primary care
Heart failure specialist (3)	Secondary care
Doctor (4)	
General practitioner (2)	Primary care
Cardiologist (1)	Secondary care
IT/ eHealth specialist (1)	Primary care

The first interview was discussed between two researchers. All interviews were audio-recorded and transcribed ad verbatim. After two interviews a topic list was made to describe the facilitating and inhibiting factors of the elements in the categories. The topics were discussed and enriched by two researchers (EW and JA) during two meetings. At the end, the findings were checked by two managers of two projects and their input was used to refine the topic list. Finally, the results were discussed in the group of the authors.

2.3 Ethical approval

The Committee for Medical Ethics UZA-UA approved this project (B300201215366). All participants signed informed consent and agreed upon audiotaping of the interviews.

3. RESULTS

The profession of included health care professionals is described in Table 1. The majority of the respondents had more than 20 years of work experience in primary care or secondary care. Two respondents had between 5-10 years of experience in the work field, three respondents between 20-25 years of experience and three respondents had more than 30 years of experience in working with chronic heart failure patients. The results will be presented in a narrative way and will follow the domains of the interview guide.

3.1 Influencing factors for implementation

Table 3 provides an overview of the facilitating and inhibiting factors.

3.1.1 *Facilitating factors for implementation*

Patient-related factors

Health care professionals reported that patients had a positive perception of TM as they seemed to experience higher levels of security, due to TM care at distance.

"But it was grateful, I thought, because I have experienced that people really appreciated it as I passed by. I've always felt very welcome at their homes. It's not just the talk about the high blood pressure, it goes further than the physical parameter and findings." (home nurse)

"I think patients get used to be monitored. They feel a particular security, they still feel that they have an extra safety." (hospital nurse)

An increased awareness of their chronic disease was present, stimulating self-care and self-management. The follow up of parameters such as heart rate, blood pressure and weight, adequate communication, clear agreements and regular telephone contact with the monitoring nurse were reported to be related to better-informed patients.

"If you need to check it yourself, then you will be more empowered." (home nurse)

"And the more we call, at a given moment, these people know they have more control on the disease. And precisely because of repetition and a questionnaire also the partner or family was more aware of." (hospital nurse)

Health care professional related factors

In general, health care professionals had a positive attitude towards new TM technology and being ready to start in practice. This positive attitude was explained based on patient responses, experiences of the impact on patient care and health care management and on collaboration between involved stakeholders. The positive responses of patients on TM towards health care professionals, as well as their belief in the effects of TM, seems to strengthen the willingness of professionals to invest in TM. Indeed, early detection of comorbidities through TM, with a proactive follow up of physical parameters, can result in a decrease or delay in readmissions. Throughout the TM projects active involvement of the patients and the informal caregiver in the care process did influence the positive attitude of the health care professional.

"You see a patient without seeing him (...) you have more contact with people who are in TM." (hospital nurse)

"And prevention would work better (...) we should therefore be able to intervene in advance. (...) If you can follow specific parameters at a distance." (physician hospital)

"And it can ensure that there are fewer admissions. I think it definitely saves time and effort and for the patient and the family it also has a very positive effect." (hospital nurse)

"I do not see monitoring only if the collection of patient data via equipment, but actually collecting data coming from the files of doctors, then I think you have a combination of both

subjective parameters, on the other hand you have objective measurements plus all the things that a patient can register with equipment." (general practitioner)

"Support (...) people indeed come after a few months back to consultation, and we follow data that is sent to me by computer, by mobile phone (...)." (hospital nurse)

"I think real profits are earned if people should be longer and more comfortable at home." (hospital nurse)

Table 2. Interview content of the semi structured interviews

Category	Topic addressed	Open ended interview questions
Patient-related factors	Quality of life Empowerment Adherence Isolation Hospital admission Mortality User friendly equipment	1. What influence does TM have on the patient with a chronic illness? How do you think it was experienced by the patient?
Health care professional related factors	Quality of health care Uniformity and standards User friendly equipment Mortality Medication intake Acceptance technology Relation health care professional-patient Time spend at health care Hospital admission Home situation	2. How did it felt to you, as a caring professional, to work with TM?
Financial and legal issues	Health finances Hospital admission Scientific evidence Structure and refund Legal clarity	3. Did TM also have financial/ legal implications according to you? Specify?
Educational topics	Education Scientific evidence Uniformity and standards User friendly equipment Training	4. Did you feel well prepared to work with TM?
Collaboration	Quality of health care Uniformity and standards	5. How was the cooperation between health care providers in your project?

Collaboration-related factors

One of the essential conditions mentioned for successfull implementation of TM was the multidisciplinary and transmural cooperation between the different health care providers. In this follow up process with close patient contacts, respondents emphasized the central role of a nurse in the process as an easily accessible coordinator in the direct care of the chronic patient.

Significant differences between projects in cooperation and collaboration were mentioned by the respondents. Adequate multidisciplinary and transmural cooperation can be facilitated by (1) good communication and clear agreements about responsibility and tasks; (2) data-sharing in a uniform way, between collaborating institutions and health care centres and (3) transparent collaboration with mutual respect between care providers in primary and secondary care. Care continuity was found to be facilitated by access to and sharing of patient data between health care professionals.

Adequate collection and storage of TM data was experienced as a fundamental element to make digital monitoring and sharing of parameters possible. Doctors and nurses, in our sample, indicated that the patient and his/her underlying problem became more clear. A central data monitoring centre could be a solution, but respondents state that centralization must remain region specific, in order to facilitate transmural collaboration.

"Because my phone is always open, I can always be reached ... ." (hospital nurse)

"An important link in the whole chain, because they can go

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home to check if data is correct." (physician hospital)

"A good file allows physicians share data." (general practitioner)

"Make a complementary picture to follow vulnerable ill patients. Cooperation is good for the patient, the patient will benefit." (general practitioner)

"How give care to the patient? (...) If we do it again on a large platform with many patients, then tailored care is lost." (general practitioner)

"There has never been help from home care to my knowledge." (hospital nurse)

"I have little contact with specialists." (home nurse)

"I have the idea that there is more one-way street with monitoring; draft a letter that is sent to another healthcare professional by mail." (hospital nurse)

"It should have been useful if the nurse, after consultation with the cardiologist, was able to adapt the diuretics to the opportunities and needs." (hospital nurse)

Table 3. Overview of facilitating and inhibiting factors for the implementation of TM

Facilitators
• The health care professional in pilot projects is motivated and has a positive attitude.
• Provision of chronic care is changing towards early detection of complications and comorbidities. A decrease in comorbidities and a decrease in readmissions is believed to lead to cost savings.
• Patient and informal caregivers are more involved. An increase in awareness of medical conditions in patients with chronic heart failure is perceived. Self-care and self-management leads to better informed chronic patients and informal caregivers.
• Sharing of patient data between health care professionals supports care continuity and collaboration.
• Administrative burden might decrease with routine monitoring and digital data sharing.
Inhibitors
• TM is an additional task because it is not imbedded in regular care.
• Standard procedures and uniformity in dealing with detected problems are lacking.
• Coordination of care is incomplete. Unclear agreements and tasks and uncertainties in responsibility and management of central patient data impede implementation in large scale projects or in usual care.
• User friendly equipment is necessary.
• The financing needs attention for devices and the services
• Patients are enrolled that may not benefit from the intervention.

3.1.2 *Inhibiting factors*

Patient-related factors

The success of large-scale implementation also will be influenced by the choice of equipment. User-friendly equipment and the patient-related costs have to be adjusted to the users, the older patient with a chronic condition.

"Then you need to offer a system that is very acceptable, no expensive requirements, and easy to use. Equipment where somewhere else already has proven his score." (general practitioner)

Health care professional-related factors

TM, and more specific the digital follow up of parameters and the telephone support, was often experienced as an additional task and supplemental burden as these are not yet embedded in regular care.

"You have to compose a new work planning (...) No, it was all on top of the tasks." (home nurse)

"Yes, and then repeat again. I think if we call someone, then a call takes 10 minutes, and that's a long time. That's day filling. Yes." (hospital nurse)

"According to my feeling we are heading for a workflow that will be too big and that we are going to keep up with stable patients who we might see four times a year, and other patients, who are less stable, will not be monitored." (general practitioner)

"Know more and score more and monitor more, that's all well and good, but if you do nothing with it (...)." (general practitioner)

Collaboration-related factors

Respondents experienced the coordination of chronic care as inadequate and incomplete. Transmural coordination between primary and secondary care was also felt to be difficult. Unclear central management of patient data was mentioned as blocking issue. Respondents mentioned that alarms were often monitored and stored within the data server of the cooperating industrial partner that provided the TM devices, often without sharing these with other care providers.

Another inhibiting element in TM was that participating companies offer different (often incompatible) devices for

monitoring. The collected parameters were in most of the cases stored on the server of the providing company. By use of different devices, centralization of patient data was not completely achieved resulting in interruption of care continuity.

Unclear responsibilities in the central management and storage of patient data impeded implementation in larger scale projects and within usual care. Problems of bi-directional communication were described repeatedly, as a result of incomplete or too cumbersome data sharing. A lack of standard procedures was an important barrier in this sharing process.

"Yes, but I think there are good arrangements to be made. (...) Who should be (...) how often are patient monitored?" (general practitioner)

"And a very important issue of TM is, that it allows to redistribute the care in a wrong way." (general practitioner)

"The hospital is an expensive affair. And so, the government hopes that, the cost for hospitalizations decrease, and there will be a budget release to serve for monitoring." (hospital physician interview)

"But in such a monitoring system, all the guidelines have to be fixed. I fear that the lack of agreements and guidelines can give problems." (general practitioner)

"I think if you should consult a good scientific study and with transparent flow charts no discussion can occur. Everyone takes responsibility." (general practitioner)

Education

Respondents stated that development of standard procedures needs to be undertaken. Experience and expertise are mentioned as essential in the use of TM. Respondents concern was the need for tailored education for health care professionals, as well as provision of clear instructions to patients with CHF and their informal caregivers at home.

"There just should be made good algorithms." (hospital physician)

"But in such a monitoring system, all the guidelines must be determined. I fear that such things sometimes give problems." (general practitioner)

"Willingness of industry to develop smart questionnaires for patients at home." (hospital nurse)

"The nurse must be trained." (hospital nurse)

"Specially trained nurses or caregivers who know the pathology well and who can solve problems regarding the chronically ill." (general practitioner)

Financial constraints

Respondents mentioned the lack of a structured financial system for the use of TM in daily practice. Unclear financial agreements about reimbursement of health care professionals in the follow up of TM, the high cost for equipment after the pilot study and insufficient procedures in the management of patient data were frequently described by the respondents as financial barriers to implement TM in regular care.

Some commercial companies offer TM devices free of charge during the pilot phase. Afterwards, financial support is uncertain and often free provision of equipment is not prolonged. Our respondents were unsure whether the patient should be willing to pay for the equipment after finalization of the pilot phase. Finally, user friendly equipment, according to all respondents, is a necessary condition to implement TM. The population with chronic conditions often consist of older persons, which implies difficulties of using new technology.

"As long as nothing is reimbursed for TM, it is always at the expense of the hospital or at the patient itself, and they can't invest much in a pilot project." (hospital nurse)

"The government must finance, industry should produce (...) there is no fee for." (hospital physician)

"Every provider of TM systems has his own website (...) at which we have to log on in various websites again so often." (hospital nurse)

"But as for me, that's a government job. I think they are working on it." (general practitioner)

4. DISCUSSION

This study describes the inhibiting and facilitating factors to implement TM for chronic heart failure at home and in a community setting, as these were experienced by field experts in TM projects.

From the included pilot studies we learned that the implementation of the projects was facilitated in case a positive perception, collaboration and communication between the health care providers did occur. Transmural collaboration between health care professionals involved in the care process of the chronic patient is an important value within the implementation of TM. Also financial topics, such as remuneration and providing and purchasing the devices needs to be addressed if projects become routine care.[22]

Addressing the problems that field experts face, is crucial to keep clinicians willing to adopt TM into routine practice.[23] A range of recent reviews described the challenges in the adoption of TM technology in health care.[22,24–26] Much of the evidence on the effectiveness of TM strategies on health-

care outcomes is insufficient.[23] Understanding the impact of TM programs requires a multidimensional evaluation approach.[25]

Grol and Wensing described a number of theories to foster implementation of innovation in health care.[21] Although all of these theories potentially contribute to effective implementation of innovations in health care, an integrated model is needed.[21,24] A review of Jang-Jaccard also described the importance of the stakeholders (governments, technology developers and providers, health professionals, and patients) involved in the implementation of TM.[26] However, special attention was outlined at recent technological advancements that had a great potential to overcome some of the identified barriers. Stakeholders' real life experiences within TM pilot projects, from qualitative research, weren't described.[26]

The strengths and the weaknesses of the categories (see Table 2: patient-related, health care-related, financial and legal issues, educational factors and factors about collaboration) as defined for this study highlight the conditions to implement TM. Chronic patients who require complex care are at high risk during the transition from one health-care setting to another.[27] For that reason, the whole transmural care process, has to be described in depth before the implementation of TM on a larger scale is possible.

The results of the analysis can support a better understanding of the critical factors of TM for chronic conditions in primary care. The field workers gave us orientation about the issues that need to be solved to make TM more supportive for chronic care in daily practice. Previous studies described the process-related themes of pilot projects and linked them to the dimension of the Chronic Care Model (CCM).[14,20] The CCM describes the elements to improve care in chronic conditions.[14,21] A significant part of the projects were the field experts in the present study worked in, did not cover all dimensions of the CCM. Moreover, none of these projects had prospects for continuation after the pilot phase.[20]

4.1 Facilitating experiences

Studies focusing on the acceptance of TM applications and the adoption and perception of technology in health care showed that personality traits of health professionals and stakeholders, such as optimism and a positive perception towards the use of TM, have a significant impact of technology.[19,28] The positive perception of patients and health care professionals towards TM is one of the most important success-factors for the use of TM technology.[29–31] In our study, all health care professionals were motivated and had a positive perception about the use of TM. This finding is supported by previous research.[29–32] To study user acceptance of technology, the Technology Acceptance Model (TAM) is a highly cited model.[32] TAM describes 'perception of facilitators' as the most important variable to consider to increase doctors' and nurses' intention to use the new technology.[29]

Many research describes acceptance models to predict the usage of innovations. Data show a number of issues that may be of concern, before widespread implementation and adoption of pilots can entailed in regular care.[33]

TM shows to have the potential to reduce the number of readmissions.[7,11,34] The respondents in the present study believed that TM leads to a better management of comorbidities and a decrease in readmissions in CHF, resulting in cost savings. The external validity of their opinions can however be questioned as all of the included projects stopped after the pilot phase. A cost/benefit study of Martin-Lesende *et al*. showed that four patients need to be telemonitored for one year to prevent one (re)admission (NNT=4).[9] Several other studies also highlight the effectiveness of TM in reduction of hospital readmissions.[8,12,35,36] Early detection of episodes of worsening or exacerbations can prevent hospital readmission. Also a growing trend towards shorter hospital stays is apparent. Good disease management in combination with TM technology leads to a successful implementation.

Our respondents also perceived TM as a good means to increase the understanding of the chronic disease process and to contribute to self-reliance and independency of patients and their informal caregivers.[37] A decrease in number of readmissions is presenting, as a result of heart failure education as part of heart failure programs. Despite the development of heart failure programs, the level adherence to prescribed medications, low-sodium diets and exercise remains lower than needed.[38] TM, as an instrument to improve adherence of patients and self-management interventions, has demonstrated significant clinical improvements in patients with CHF.[38]

4.2 Hindering experiences

Despite these positive experiences, respondents also described ambiguities in their tasks during patient care. These were related to responsibility, legal issues and financial aspects. In previous research, Willemse *et al*. described financial constraints as one of the pitfalls why TM projects did not succeed.[21] Financial and legal agreements should reflect cooperation between primary and secondary care. The way health professionals should work together and who should have the intra-regional final responsibility, remains vague and unclear. Therefore, uniformity and standardisation, clarification of responsibilities and optimization of financial and legal aspects, preferably in a multidisciplinary context, is primordial for successful implementation of TM. TM can be supportive in the management of chronic care, but this

requires an extensive reorganization of the healthcare system.

Based on these qualitative findings some recommendations can be made to improve acceptation and adoption of TM in the community. TM users need to have a positive perception as a necessary condition for the success of TM implementation and TM should ideally be embedded as much as possible in usual care.

Chronic disease programs need to be strengthened and well described, with TM used as a supportive and added technology. Financial and legal aspects need to be defined and supported by the government. Incentives for the development of expert-functions and competences in the use of TM, with focus on transmural collaboration and education of patients and health care professionals needs to be foreseen.

Future research in larger scales projects can identify other key issues (barriers as well as facilitators) for successful implementation of TM in usual care. The CCM can be used as a framework, to guide chronic care management. A pro-active approach, in which the chronic patient is supported by the health care professional, is an important asset in the use of TM at home. Self-care and self-management of patients' chronic disease seems to result in more disease awareness. Also informal caregivers will be more involved in the care process, in order to support the chronic patient. Devices need to be standardised and should help transmural and interdisciplinary use.

Further research in subgroup populations is also needed. Inclusion criteria for persons with a chronic disease in a TM monitoring project need to be defined. The differences between monitored subgroups of chronic patients in terms of health improvement, quality of life and well-being, economic savings and overall management of the chronic disease must be described.

4.3 Strenghts and limitations

This study provides insight into healthcare professionals' perceptions towards TM. The sampling of participants was restricted by resources in this study and limited to the participants of the pilot projects. The researchers are not sure data saturation could be reached. Nevertheless, lessens are learned from this data. The sample was purposefully selected with one field expert from each pilot project. There was only a small amount of non-invasive TM pilot projects in patients with chronic heart failure. There were no extra field experts with real life experience within the pilot project available for an interview.

Participation in this study was voluntary and therefore the results are biased towards interested providers with already some positive attitude. When introduced with the aim of the study, the healthcare professionals were told that their views were important for helping to enhance the intervention for future use and we encouraged them to reflect about aspects they did not like. Despite the small sample, the data does provide heterogeneous information from experiences within the projects. Pilot studies offer the opportunity to test interventions and identify potential problems during development which may negatively affect implementation. We did not interview the patients and their informal caregivers. Future qualitative studies are also needed to further examine patients' views.

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CONFLICTS OF INTEREST DISCLOSURE

No conflict of interest was declared by the authors.

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