Point-of-Care Testing in Diabetes Management: What Role Does It Play?

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Abstract

Diabetes is a multisystem disease requiring complex management provided by a variety health care professionals (HCPs). Comprehensive care of patients with diabetes requires frequent testing of hemoglobin A_{1c} (A1C), and research indicates that use of point-of-care testing (POCT) can affect patients' A1C results in the shortterm. The purpose of this qualitative study was to explore the ideas, opinions, and expectations of HCPs and patients with diabetes about the potential role of POCT, including its impact on patient-provider interactions, patient care, and issues of implementation.

In-depth interviews, which were audiotaped and transcribed verbatim, were conducted with key stakeholders. The analysis used immersion and crystalization strategies. Thirty-seven interviews were conducted: seven with endocrinologists and internists, seven with family physicians, eight with diabetes educators, seven with family practice nurses, and eight with patients with diabetes.

Two major themes emerged from the data analysis: *1*) the impact of POCT on the clinical encounter and the care of patients, and *2*) the POCT machine, including accuracy and the cost of incorporating the machine into clinical practice. The analysis revealed strong similarities across all groups of HCPs, and patients also expressed similar concerns.

This study illuminates perceptions of HCPs and patients regarding the impact of POCT on diabetes management. POCT was viewed as having many benefits in the clinical care of patients with diabetes, including face-to-face encounters that offer immediate feedback, proactive patient education, increased collaboration between patients and providers, and improved patient adherence. However, logistical issues, such as the machine's accuracy and cost factors, could be significant barriers to implementation

Diabetes is a multi-system disease requiring complex management provided by a variety health care professionals (HCPs). These professionals engage patients in prevention and management strategies to decrease long-term complications of diabetes.[1–3] One important strategy is frequent hemoglobin A_{1c} (A1C) testing, which has traditionally required laboratory facilities. However, patient concordance to frequent testing can be problematic and can serve as a barrier.[4–6] Furthermore, the laboratory results informing HCPs may not be current and may delay appropriate management. Thus, availability of more immediate laboratory testing and subsequent results, carried out during patient visits, may influence diabetes management and subsequent patient adherence.

This type of testing, called point-of-care testing (POCT), has been defined as "any investigation carried out in a clinical setting or the patient's home for which the result is available without reference to a laboratory and perhaps rapidly enough to affect patient management."[7] POCT technology directed toward diabetes management includes machines that measure A1C and urine analyses that screen for microalbuminuria and nephropathy. POCT has been found to have a positive impact on the process of care in the management of patients with diabetes.[8–10] Studies have also described an improvement in patient satisfaction and glycemic control as a result of the

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immediate feedback of POCT.[8,9]

There is, however, limited research reflecting the perspectives of HCPs and people with diabetes regarding the role of POCT on diabetes management and the potential impact of POCT on routine diabetes care. The purpose of this study was to explore ideas, opinions, and expectations of HCPs and people with diabetes about the potential role of POCT in diabetes management, specifically the impact of POCT on patient-provider interactions and patient care, as well as issues of implementation.

METHODS

Sampling and Recruitment

This study used the qualitative methodology of in-depth interviews. Participants were purposefully chosen from five groups who were potential users of POCT for diabetes. These included endocrinologists, family physicians, family practice nurses, diabetes educators, and people with diabetes. A maximum variation sample of the health care professionals was determined by their practice location (urban/rural), practice size, and academic affiliation.[11] They were identified from existing membership lists or staff listings of local hospitals in southwestern Ontario, Canada. Potential participants who had diabetes were recruited from the local chapter of the Canadian Diabetes Association in London, Ontario, Canada.

The final sample size was determined from the continuous analysis of the interviews and ceased once the researchers agreed they had reached theme saturation in that no new concepts or ideas were being introduced by the participants.[11] Saturation was achieved in all five of the potential user groups listed above. Ethical approval was received from the ethics review board for health sciences research involving human subjects at the University of Western Ontario.

Data Collection

The semistructured interviews, conducted primarily in participants' offices or homes, were audiotaped and lasted ~ 30 minutes. The interviews were conducted by either the project coordinator or the research nurse. Interviewers explored the participants' ideas, opinions, and expectations about the potential role of POCT in diabetes management and the impact of POCT on patient-provider interactions. For example, open-ended questions included, "How would access to POCT influence your management of patients with diabetes?", "What would be the impact of POCT on the interaction with your patient?", and "What would be the impact of POCT on your compliance with physician or nurse recommendations?" The audiotapes were transcribed verbatim and transferred into the NUD*IST qualitative software program.[12]

Data Analysis

Immersion and crystallization analysis strategies were used.[13] This required that all of the researchers (J.B.B., S.B.H., S.W.B., and S.P.) read all the transcripts independently, identifying key phrases or concepts used by the participants during the interviews. They then met to compare and contrast their individual findings and thus clarify and expand the themes. Discussions ensued until consensus was reached. Next, patterns, categories, and themes emerging from the interviews from each participant group and across all groups were examined using the qualitative software program noted above. This aided in clarifying the most prominent themes and securing the most relevant quotes for illustration. The analysis was deemed complete when there were no new themes emerging, again based on having reached saturation.[11]

Authenticity

Credibility of the data was established by audiotaping and transcribing all of the interview data verbatim, maintaining field notes, and systematic individual and team analysis. The multidisciplinary composition of the research team also enhanced the credibility of the analysis and interpretation of the data.

FINDINGS

A total of 37 interviews were conducted. These included interviews with seven family physicians (four urban and three rural), five endocrinologists (five urban), two internists (one rural, one urban), eight diabetes educators (five urban, three rural), seven family practice nurses (four urban, three rural), and eight people with diabetes who all dwelled in an urban community.

Two major themes emerged reflecting the participants' ideas, opinions, and expectations about POCT. One theme was the impact of POCT on the clinical encounter and the care of patients. The other theme was specifically on the POCT machine, including accuracy and the cost of incorporating the machine into clinical practice. It was apparent in the analysis that there were strong similarities across all of the HCP groups, and, consequently, they are reported as a common voice. While participants who had diabetes also expressed similar perspectives, within each subsection reported below they are reported as a separate group and are referred to as patients given the clinical context.

Impact of POCT on Clinical Care

All of the participants acknowledged the valuable impact of POCT on the clinical care of patients with type 2 diabetes. The information provided by POCT was viewed as immediate, convenient for all involved, and an aid to clinical decisions for diabetes management. Participants perceived the receipt of the information in a face-to-face manner as enhancing the patient-provider interaction, as characterized by improved communication, opportunities for patient education, and ultimately increased patient adherence. Further detail on each of these components of the clinical encounter are described below.

Immediacy of results. Participants endorsed immediacy of results as the greatest advantage of POCT and viewed it as enhancing clinical care. A typical sentiment, as one HCP expressed it, was that, "Immediate answers are incredibly important to patients these days . . . so it is sometimes not acceptable for them to wait 3–4 weeks to get a result of a microalbumin."

Participants said that the immediate results allowed HCPs to "strike while the iron is hot" and to "decide on a management change potentially right then and there." Being able to recommend specific changes was perceived as more efficient and thorough. "It makes the process more efficient in terms of recommendations you're going to make to the person and to

check on how they're taking care of their problems."

From the patients' perspective, the immediacy of POCT had many benefits. As one patient noted, "If I have any problems, or if I have any questions from the results, I can discuss it with him right away and it saves me time, saves me the anxiety of waiting, and he also can take action right away."

Information shared during the clinical encounter. HCP participants perceived another benefit of the immediacy of POCT as being the exchange of information in a face-to-face encounter with patients. This was preferred over a telephone exchange and viewed as having more impact. As one participant noted, "I think that it would save time, you would be able to address it right then and there with the patient in person. Which I think carries a different weight than having it over the phone." Patients agreed. "I think it delivers more punch . . . and you can problem-solve and troubleshoot."

Information could be shared between patients and providers, therefore enhancing the dialogue between them and clarifying patients' understanding and further concerns. As one family practice nurse stated, "If you're taking the time to explain test results that are immediate like this, I think the patients then feel comfortable in asking you further questions, which can help you establish whether or not they're understanding what you're telling them, but also evaluate what direction you need to go with them."

In addition it could also assist clinicians in determining the most appropriate care plan, enhancing patients' ability for self-care. Said one HCP participant, "I think it gives you better ability to sort of focus the care and empower the patient with giving them information and numbers, and so that they know what is going on with their own diabetes."

Patient education and patient adherence. There were strong links between the immediacy provided by POCT, face-to-face communication, and the opportunity for relevant and proactive patient education. This was most frequently mentioned by nurses and dietitian educators, including one who praised "the motivational aspect and moving patients along. Quite often, they forget, and so you have to then turn around and reiterate and reinforce. Sometimes, having that piece of information right then and there, you can say 'OK, this is where we are at, and we need to move along.'"

Participants described the face-to-face feedback and opportunities for education as affecting patient adherence with the management regimen. Said one, "Well, if you believe the quality of the interaction is better, then I would say the fall-out would be the compliance benefit." An outcome of a face-to-face discussion with an HCP about the POCT results could assist patients in modifying their own care and taking personal responsibility. Said another patient, "I think it would have a very direct impact, because it gives you a picture of where things stand right at that very moment, and you can take corrective action in terms of what you are doing."

Thus, through the face-to-face discussion of the POCT results, patient motivation and adherence would be enhanced, further strengthening the collaborative working relationship between patients and their HCPs. "You've got the clinical results right in front of you, but that's just a stepping stone," said one HCP participant. ". . . it gives the opportunity for the patient to relate to how those clinical tests are actually going to impact on their care. . . . I think patients then feel comfortable in asking you further questions."

Patients confirmed this perspective. "So, I think that it would definitely help the discussion with your family physician," one noted. And another patient stated, "You have to face the music. Whereas when you go to the lab later and you get the results over the phone, it doesn't have the impact that it does when you're sitting in the office, and your physician begins to shake his finger at you or whatever it is that he or she needs to do to get you motivated. I think it makes a big difference."

Accuracy and Cost: Barriers to Implementation

As noted above, all participants believed that POCT had an important role to play in diabetes management. However, the potential barriers to the implementation of POCT, namely, accuracy of the machine and cost, were another pervasive theme throughout the interviews.

Accuracy. The primary concern articulated by most HCPs was the accuracy of the machine providing the POCT. "Accuracy is really important and confidence that it is accurate," said one. In order to ensure accuracy, quality control was seen as important, including training of personnel who would be routinely using the POCT.

Patients also emphasized the importance of accurate results. When assured of the accuracy of POCT, all participants endorsed the application of POCT technology. "As long as it is accurate," one patient said, " . . . then I think it could be a very valuable tool for all health care professionals."

Cost. The issue of cost was at the core of the logistical concerns regarding POCT that would ultimately dictate decisions regarding implementation of the technology. Personnel issues were raised by all. Participants identified concerns regarding the costs associated with staff training. "How much training do you need to be able to use this?" one asked. Also, the cost associated with staff performing extra duties could be a potential barrier. As one physician noted, "It would be a task delegated to the nurse, but it would impact indirectly on my time by the amount of additional time that the nurse uses."

Concerns about the logistics of implementing POCT also included issues regarding the physical space necessary, in particular the cost associated with changes or renovations. One participant noted that ". . . there would be an issue of where to locate it so it's accessible to a lot of people." Participants believed that the cost concerns would also be determined by the location of HCPs' practice. "In my setting, I would assume that's a hospital budget issue, and in the family doctor's office, that's a much more personal issue," one participant noted. Even participants working in a hospital questioned which hospital department budget would be responsible for the cost of POCT. "The cost is a drawback," said one. "And I don't know whose budget these would come under."

The cost, therefore, could be a major deterrent to the implementation

of POCT. As one participant summed it up, "Who's going to cover the cost of this? . . . It's not so much the equipment in the first place, but to keep the sticks on hand to be used on patients can be costly, and if that's not covered, then why would a physician do it this way? Why wouldn't they send the work out to a lab?"

If these financial issues could be resolved, participants believed that POCT would promote an efficient use of time and would therefore be cost saving. For example, some physicians justified the expenditure of increased time by themselves and their staff at the outset as potentially saving time in the future. "It would increase the length of a patient visit, but it would decrease the phone calls and staff time later on." Many participants justified the extra time required as possibly time saving. "If you compare it to having to follow-up a week, two weeks, a month later with results, I think ultimately it would save you time." Patients also perceived a cost-saving potential. "If this could be done in the doctor's office, the amount of money it would save in the health care system is phenomenal."

DISCUSSION

This study provides unique insights into how POCT may change and enhance the clinical encounter and thus improve patient management. Furthermore, the study findings identify barriers to implementation, in particular the cost of POCT.

Immediacy and convenience were viewed as important benefits of POCT. Being able to provide and discuss the results face-to-face rather than over the telephone was felt to have more of an impact on patients. It also allowed HPCs to recommend changes in management at that visit. Furthermore, the opportunity to provide test results immediately, in a face-to-face encounter, was perceived by participants as promoting shared decision making.

More than a decade ago, Kaplan et al.[14] produced compelling evidence about the impact of information sharing and active patient participation during patient-doctor interactions on patient health outcomes. A more recent study by Little et al.[15] found that patients expect communication with their physician to include information sharing and expect to be engaged as a partner in their care. Our findings reflecting the views of multiple HCPs and patients endorse this prior research.

Perhaps most importantly, our participants viewed POCT as an opportunity to capitalize on patient education. As Price[16] stated, POCT "will be beneficial only if appropriate action is taken on the result." Therefore, it may not be sufficient to simply report results to the patient; that must be accompanied by comprehensive diabetes management that motivates patients to assume a greater level of self-care.

Participants' expectations that POCT would positively impact patient outcomes, such as adherence and immediate adjustments to hyperglycemia management, have been found in prior research.[8–10] Participants generally viewed POCT as a potential time saver (i.e., fewer telephone contacts and return visits), although this has not been found in prior research.[9]

Although our participants strongly endorsed the value and advantages of POCT, logistical factors could still prevent the implementation of this technology. Our findings revealed concerns about accuracy as being foundational to any discussion of using POCT. Financial issues were the other principal concern of the participants and dominated the discussion.

Costs associated with POCT have been noted previously.[16,17] Participants' concerns reiterated observations made by Delaney et al.,[18] who observed that without evidence to support the cost effectiveness of POCT, the implementation of this technology in primary health care settings would be low. A review by Baer[19] of the cost of POCT versus performing the same tests in laboratories found that approximately half of the studies reported POCT as being less expensive. Even when considering the cost of POCT in the hospital setting, there is contradictory evidence.[17,20] Dolega[21] has called for outcome studies to balance the cost of POCT with medical need, doctor and patient preference, and the effect on total health care costs.

Hence, cost may be the driving force behind the implementation of POCT. Rapid advancements in POCT technology may eliminate many of the logistical concerns, such as space requirements and accuracy. But until issues of remuneration are addressed, specifically for community-based practitioners, the cost will remain a concern, and implementation will be stalled.

CONCLUSIONS

Having access to immediate results can help improve HCPs' communication and collaboration in the management of their patients with diabetes. This information promotes face-to-face communication not only between patients and providers but also among HPCs. Furthermore, patient education efforts can be coordinated and reinforced by all HCPs working with a given patient.

Participants viewed the ability to accelerate the clinical decision-making process, specifically at the time of the patient visit, as an important aspect of POCT in diabetes management, and this is supported by prior research.[22] This also reinforces patient-centered practice, which encourages management decisions to be specific to patient needs, promote partnerships between both patients and HPCs, allow opportunities for prevention and health promotion, and enhance patient-HPC interactions through improved communication and finding common ground regarding management.[23,24] Patient education will then transpire within an interaction between patients and HPCs that promotes self-care behavior.

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