Accelerating Artificial Pancreas Research through the Development of Data and Communication Standards

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Abstract—The development of interoperable data and communication standards for diabetes devices will accelerate the ongoing development of the artificial pancreas by facilitating the integration of its component technologies. This initiative brings together key stakeholders to develop effective, practical standards for the diabetes device industry.

Recent advancements in diabetes device technology—particularly with respect to the development of continuous glucose monitors—have brought the vision of an automated artificial pancreas (AP) closer to reality. Such technology would improve the lives of millions of individuals with type 1 diabetes globally. However, integrating multiple components into advanced closed loop systems is fraught with technical challenges. Currently, the lack of open standards for communication between diabetes devices (i.e., insulin pumps, blood glucose meters, continuous glucose monitors) makes this task even the more difficult, as interfaces must rely on proprietary communication protocols unique to the manufacturer. A landscape of closed proprietary systems also limits the potential for innovation from new entrants and hinders the progress of the artificial pancreas and new diabetes management tools.

With the aim of addressing these barriers, JDRF has sponsored the Artificial Pancreas Standards and Technical Platform Project, as part of their Canadian Clinical Trials Network initiative. The project will be led by a team from the Centre for Global eHealth Innovation from the University Health Network in Toronto [1, 2] who will bring together key stakeholders from industry, academia, healthcare, and the diabetes community to advance the development of interoperability standards. It is only through such a collaborative effort that effective and practical device communication standards can be developed.

Stakeholders must have a suitable forum to discuss, develop, and ratify standards for medical devices. The IEEE-11073 Personal Health Device (PHD) Working Group was established for the purposes of building a standard that would accommodate the resource requirements of PHD devices [3]. This diverse group of contributors provides vital perspectives on the requirements and facilitates future adoption of the standard. Currently, device specializations are under development for insulin pumps (IEEE-11073-10419) and continuous glucose monitors (IEEE-11073-10425). The device specialization for the blood glucose meter (IEEE-11073-10417) has already been accepted, though it continues to be reviewed for future revisions. The development of these standards is moving forward, both through the collaborative efforts of the PHD Working Group, as well as ongoing discussions that the project team is conducting with AP researchers and diabetes device manufacturers.

Standards are also under development within the Bluetooth Special Interest Group (BT-SIG). An ongoing effort is being made to ensure that the standards developed by the IEEE and the BT-SIG have compatible data objects, allowing for lossless translation between the two protocols. This ability to transcode the data would allow for the interoperability of devices using either standard [4].

A key benefit of developing interoperability standards is to facilitate a shift towards higher valued activities. This benefit is one that should be realized by diabetes device manufacturers and AP researchers alike. Manufacturers would pool their resources to develop effective standards, and would thereby be able to shift more of their development efforts to the base technology of the devices, such as sensor technology. AP researchers would also be able to shift their resources to the development of the critical control algorithms, rather than expend great effort on integrating a host of devices using proprietary communication protocols. It is with these advantages in mind that we continue to move this initiative forward and accelerate the innovation that will enhance diabetes care in the future.

References