

## ACADEMIC REVIEW REPORT FORM

<b>EDU:C UNDER REVIEW</b>	Temerty Centre for AI Research & Education in Medicine (T-CAIREM)
<b>COMMISSIONING OFFICER</b>	Professor Patricia Houston, Interim Dean
<b>REVIEW DATE</b>	Tuesday February 4, 2025
<b>REVIEWERS' NAMES</b>	Timothy Chan – Associate Vice-President and Vice Provost, Strategic Initiatives and Professor, Dept. of Mechanical & Industrial Engineering, University of Toronto Gillian Hawker – Professor (and former Chair), Dept. of Medicine, University of Toronto and Senior Scientist, Women’s College Hospital Research Institute

We appreciate being given the opportunity to conduct the first five-year review of the Temerty Centre for AI Research and Education in Medicine - T-CAIREM. We met with the Director, Muhammad Mamdani; T-CAIREM theme leads for education, research, data infrastructure, and community; trainees and administrative staff; and other key stakeholders, including the cognate university academic leads and Justin Nodwell, Vice Dean, Research and Health Science Education. The overall message to us was that Muhammad Mamdani’s leadership, vision and engagement has been masterful. He has led the creation of a highly effective and cohesive interdisciplinary team to support a true community of scholars bound by a keen interest in advancing AI in health.

Our findings are based on careful review of the self-study report, the terms of reference provided to us for this EDU:C review, and what we heard and learned during the site visit.

### ACADEMIC REVIEW SUMMARY

We applaud Professor Mamdani and his team for their success in establishing T-CAIREM as an inclusive community for like-minded individuals in the AI & health fields within the university and beyond. They have clearly been recognized for their leadership nationally and internationally, which is remarkable since T-CAIREM has only been in operation for five years! Their achievements have accelerated learning, interdisciplinary collaborations between clinicians, engineers and computer scientists, and the generation of new knowledge. They have effectively engaged and inspired trainees to pursue careers in this field, drawing global interest in their educational offerings. The administrative team that supports T-CAIREM is equally impressive; they truly enjoy working together and feel valued and respected by the Director and faculty leadership. These first five years have demonstrated high demand for education in AI and medicine; the next five years must ensure capacity to continue delivering on their important mission in a financially sustainable manner.

### SPECIFIC FINDINGS

#### 1. RELATIONSHIPS

*Scope and nature of relationships with cognate Departments/EDUs, Strength of the morale of members, learners, and staff, initiatives undertaken to enhance a sense of an inclusive community in the EDU:C, extent to which the EDU:C has developed or sustained fruitful partnerships with affiliated hospitals, research institutes, organizations, and other universities in order to foster research, creative professional activities, and education, social impact of the EDU:C in terms of outreach —locally, nationally, and internationally*

### Strengths:

- There was overwhelming agreement that Professor Mamdani is an exceptional leader. He was described as 'visionary', a fantastic advancement partner' & noted to have created 'something from nothing'.
- Staff, faculty, trainees and members agree that T-CAIREM has established a strong sense of inclusive community for like-minded individuals in the AI & health fields within the university and beyond, which has resulted in accelerated learning, inter-disciplinary collaborations between clinicians, engineers and computer scientists, and the generation of new knowledge.
- The team spirit, positive morale & inclusiveness of T-CAIREM was palpable. One staff member noted "*It's always been a real joy to work for this team*". The Theme Leads were enthusiastic in their discussion of team relationships, interactions with key partners, and superb leadership from the Director.
- Trainees were enthusiastic about their many opportunities to participate in T-CAIREM activities to build community partnerships nationally and internationally, e.g., datathons, summer studentships and workshops on AI and equity.
- T-CAIREM is seen as a model of excellence for integration of AI in medicine internationally and has been the recipient of international awards – twice – for its impact in the field.
- T-CAIREM has established highly productive partnerships with hospitals and universities nationally (e.g., UBC's Data Science Institute) and internationally (e.g., Technion - Israel Institute of Technology). Individuals from these partner organizations wholeheartedly agreed that they had benefited from collaboration with T-CAIREM. The inclusion of trainees from centers outside the U of T in datathons, for example, was specifically noted as a benefit to other institutions, enabling a broad education of health care professionals in AI. National and international collaborative efforts have taken off, generating new research initiatives across organizations.
- The importance of interdisciplinary collaboration and inclusivity were key themes of discussion; administrative staff noted repeatedly that creating an inclusive environment for everyone is a must.

### Areas for Improvement / Opportunities for Enhancement:

- There was uneven understanding of the goals and 'value add' of T-CAIREM, which appeared to stem from the different perspectives and needs of key stakeholders (within versus beyond TAHSN), the existence of other institutes/organizations within the university focused on AI (Vector Institute / Schwartz Reisman Institute for Technology and Society / Data Sciences Institute) and strong AI-focused research and infrastructure within the affiliated TAHSN hospitals.
  - For example, while some participants referred to the importance of the Health Data Nexus (HDN) for teaching students, others wondered whether it truly added value to researchers and whether the investment in the HDN could not be better spent elsewhere.
  - On a related note, the datasets held in the HDN are largely those submitted by the Director. It was unclear what had been done to augment these offerings (had a formal call been made to clinical faculty?) and what might entice others to contribute.
- Relative to other university groups engaged in AI scholarship, T-CAIREM distinguishes itself by its focus on health. However, this focus does not differentiate it from groups within the TAHSN hospitals. This appeared to be undermining the ability of T-CAIREM to establish meaningful engagement with the hospitals. Professor Mamdani's position on the senior leadership team of Unity Health may also be perceived as a conflict of interest by the other hospital sites.
- Awareness of T-CAIREM was variable, and notably low among the TFoM clinical chairs. Most knew about T-CAIREM, but many were unsure why they should get involved and whether their existing faculty and students were involved.

- T-CAIREM has invested in many different relationships, including MOUs with international partners, broad and variable educational offerings, and both grant and salary support for research. This diverse portfolio of activities further led to confusion about the overarching mission of T-CAIREM and is unsustainable without a steady source of income to continue funding such initiatives.

## 2. RESEARCH

*Scope, quality, and relevance of research activities; how Excellence Through Equity is integrated into the EDU:C's research, scholarship, and collaborations; appropriateness of research activities for learners; appropriateness of the level of research activity and funding relative to national and international comparators; and appropriateness and effectiveness of the academic unit's use of existing human resources*

### Strengths:

- There was full agreement that the quality and scope of research activities conducted by T-CAIREM members was superb – internationally leading. One T-CAIREM member commented “We’re the world leaders in the work that’s being undertaken here”. It was noted that the research facilitated by T-CAIREM is innovative and often more forward-thinking than what traditional funding agencies would support – projects that are “...not necessarily proven and run of the mill.”
- Theme Leads noted that EDIIA has been integrated into research through various initiatives and support structures. Staff noted that the research is being conducted sustainably and ethically.
- Non-clinical T-CAIREM members noted that the relationships developed between their faculty and clinicians had allowed them to move their AI initiatives forward faster by linking them with people who understood how the applications might be useful. It was noted to be particularly helpful to bring clinicians in at earlier stages of development.
- Although it was difficult to separate out the contribution of T-CAIREM from the overall research engine of the university given that the faculty reside in hospitals and departments elsewhere, there was acknowledgement that grant funding enabled by T-CAIREM has supported the AI research of faculty members across the departments/institutions. The creation of salary support awards (Professorships) was seen as very helpful.
- There was clearly strong support and sponsorship of trainees from diverse backgrounds. The appropriateness of research activities for trainees was emphasized. It was noted that internship and training opportunities have been very popular and provide valuable hands-on experience and exposure to various fields. It was noted repeatedly that T-CAIREM educational opportunities draw participants from across Canada and beyond.

### Areas for Improvement & Opportunities for Enhancement:

- Total funding for research provided by T-CAIREM was considered small relative to national funding opportunities. There was lack of consensus on the value of small pilot funding versus larger grants. T-CAIREM grants cannot take the place of external funding, and so any internal funding should be given out with a view towards catalyzing (rather than cannibalizing) downstream funding applications and successes.
- Theme Leads noted the high demand on T-CAIREM from faculty interested in using AI in their research is challenging their capacity to deliver, as is the rapidly changing field of AI (the latter was noted to be an opportunity as well).
- There was lack of clarity among those outside of T-CAIREM regarding research on the societal/ethical impact of AI in health and health care. How T-CAIREM engages with the Schwartz-Reisman Institute, for which this topic is a focus, was unclear.
- There was agreement that there is opportunity for greater overlap and alignment with CQuIPS; AI integration in quality improvement and patient safety is already occurring at Unity Health and SickKids.

- There was a perceived need for better collaboration and integration of AI projects across departments due to concerns regarding redundancy.
- It was noted that the Director has been cautious in using the Temerty funds. There were calls for increased funding to support more projects “We have a huge community and a lot of amazing ideas.” If spending is increased in the future, the plan should be coordinated with the Dean and TFoM Advancement, especially if the plan is to return to the Temerty family for another infusion. Spending funds too slowly or too quickly can be problematic.

### 3. EDUCATION

*Scope and quality of educational activities and initiatives (e.g., courses, programs, communication strategies); Extent to which the EDU:C is fulfilling its education mandate; and EDU:C's actions to enhance EDIIA*

#### Strengths:

- T-CAIREM was seen to be fulfilling its educational mandate effectively, providing valuable training and mentorship opportunities. The educational initiatives were praised for their scope and quality, particularly the integration of AI and data science into formal curricula from undergraduate programs to medical school.
- The vital role of the student co-leads for education was noted; the faculty felt that without these individuals the educational offerings would not be possible at the current level.
- Education was generally seen as the major ‘value add’ of T-CAIREM to the TAHSN community. Some department heads felt that education should be the T-CAIREM brand going forward, engaging with all levels of learners. Building capacity in the field of AI in Medicine was seen as critical and something that T-CAIREM was ideally positioned to lead.
- Non-clinical T-CAIREM members, e.g., those in engineering and computer science, noted the enormous benefit they had derived from having access to health datasets for teaching – the Health Data Nexus. Enabling access to clinical datasets for education in computer science and engineering was noted as a key strength/accomplishment of T-CAIREM – unique compared with other institutions. The team is noted to have been extremely supportive in figuring out all the needs in a classroom and providing them.
- As noted elsewhere, T-CAIREM was noted to have made substantial efforts to include diverse levels of training and backgrounds.
- Administrative support for education initiatives is outstanding; staff commented that they worked in a highly cohesive team where everyone has a voice.

#### Areas for Improvement & Opportunities for Enhancement:

- The diversity and number of educational offerings has expanded exponentially over the five-year period. Furthermore, there are growing calls for residency/fellowship training in addition to undergraduate MD course development and conduct. All involved are finding it challenging to keep up – additional faculty leads are felt to be needed. Of note, when asked, the clinical department chairs all indicated they had capacity to recruit in this field.
- An additional challenge on education delivery is the rapidly changing field of AI – specific tools introduced in a course could quickly become obsolete. This requires non-stop reflection and pivoting. It has also been challenging to figure out the best way to deliver education offerings, e.g., virtual or in person, synchronous or asynchronous; one size did not fit all needs.
- An external collaborator noted that an education subgroup had been created and a survey of existing national AI in medicine educational offerings was being developed, but they had not heard anything in a while from the leads – the work had appeared to ‘fizzle’. There was interest in continuing this work.

#### 4. ORGANIZATIONAL + FINANCIAL STRUCTURE

*Appropriateness and effectiveness of the EDU:C's organizational and financial structure, and its use of existing human, physical, and financial resources; appropriateness with which resource allocation, including space and infrastructure support, has been managed; opportunities for new revenue generation*

##### Strengths:

- T-CAIREM is seen as having very strong administrative support. The admin team described their office set up and meeting spaces as highly efficient. Several team members noted there was very high role clarity, and that the growth trajectory demonstrated the organizational effectiveness of T-CAIREM. The team has highly functional regular meetings and communication is effective.
- Professor Mamdani is seen by the administrative staff as highly engaged. He is available to discuss concerns and provide feedback at the drop of a hat, even though he holds a major leadership role at Unity Health.
- No concerns were raised regarding space and infrastructure support other than keeping up with the ever-expanding demands for training/education. Other than office space on Bay St, the team largely functions virtually.
- T-CAIREM has a communications lead, supported by the communications lead from LMP and indirectly by TFOM. Many stakeholders we met with commented on the usefulness of the T-CAIREM website.

##### Areas for Improvement & Opportunities for Enhancement:

- Theme leads are stretched. They often hold multiple roles in addition to those with T-CAIREM, which can limit engagement with and timely feedback to staff. The stipends paid to these individuals may be insufficient to allow them to free themselves up to focus greater attention on T-CAIREM responsibilities.
- Revenue generation was clearly top of mind for the administrative staff and leadership team at T-CAIREM given that the initial funding from the Temerty Family is time-limited. Consideration has been given to generating revenue through 'membership' to T-CAIREM, e.g., from the pharmaceutical industry and TAHSN hospitals. However, many stakeholders outside of TAHSN (and even some within TAHSN) questioned the value proposition for both industry and the hospitals.
- Although educational offerings have been provided free of charge within the U of T/TAHSN, it was noted that requests for training/education from beyond the university come with the expectation that a fee will be charged. Setting benchmarks for these fees will be helpful going forward, as will clarifying the "service" expected by TFoM of T-CAIREM regarding medical education – undergraduate MD and postgraduate residency/fellowship. That said, some expressed concern regarding the long-term viability of a revenue generation strategy based largely on educational programming.
- While T-CAIREM leadership and administrative staff identified no concerns regarding their communications activities, it was clear from our meetings that individuals outside of T-CAIREM, particularly in the clinical departments, were not knowledgeable about what T-CAIREM was up to – achievements and opportunities for engagement and learning. As a result, they were unable to ensure that their faculty were aware of what T-CAIREM offered. Some asked who is the target audience for communication? The focus seemed to be disproportionately on external national and international versus internal university / local TAHSN players. While Professor Mamdani has presented to TFoM all chairs committee, he had not been invited, to their knowledge, to present specifically to the clinical chairs. Additionally, there was a sense that the TFoM communications, and UofT Communications by extension, could better highlight the excellent work of T-CAIREM. The fact that there are several communications groups (including LMP) that could potentially touch / participate in T-CAIREM communications elevates the importance of coordination.

## 5. LONG-RANGE PLANNING CHALLENGES

*Clear articulation of a strategic academic plan that is consistent with the University's and Temerty Medicine's academic plans; management, vision, and leadership challenges in the next 5 years; consistency with Temerty Medicine's commitment to equity, diversity, inclusion, Indigeneity, and accessibility to attain Excellence Through Equity; planning for advancement and leadership in approaching alternative sources of revenue, and appropriateness of development/fundraising initiatives; and space and infrastructure considerations.*

- The existing strategic plan is consistent with University and TFoM plans – *sustained leadership in AI and medicine.*
- It was consistently noted that plans must meet the evolving needs and priorities of the university/TFoM and the rapid-fire developments in AI.
- Not surprising to the reviewers, the need for better, more efficient sharing of data across TAHSN was expressed repeatedly. We felt that Melanie de Witt, legal counsel at Unity Health seems well-positioned to moving this forward but she noted that the hospital legal leads require direction from their CEOs to break down barriers to data sharing.
- As noted above, the capacity to deliver is being strained by high demand. Planning should incorporate recruitment of additional faculty, perhaps to the university, to bolster theme leadership, particularly in education. Continued reliance on the relatively small number of AI in medicine experts is not sustainable.
- T-CAIREM leadership is advised to ask themselves what success for T-CAIREM looks like. When asked during our meetings, responses included the following: international leadership in AI education; enhanced capacity to inspire and execute AI adoption in medicine; closing identified knowledge gaps; providing analytics space by ensuring datasets to learn, grow and develop; and successful implementation of AI in healthcare. Whether T-CAIREM has the capacity, and ability, to achieve all these goals is unclear – the potential mission is so broad that it can encompass an entire school/faculty. Where they can be most impactful should be clarified. As noted earlier, many outside T-CAIREM feel this focus lies in their influence on education/capacity building in the field of AI in medicine as opposed to active deployment of AI tools within the health care setting. The latter will be enabled through training and mentorship/sponsorship of those trained. Implementation requires inside people.
- Given the current struggle across Canada regarding primary care and chronic disease prevention and management, greater consideration might be given to finding ways to enhance AI research that utilizes the rich data available outside hospitals, where most health care happens, for research.
- Communications within U of T/TFoM need to be strengthened. It was unclear to the reviewers if key messages were getting through to the uninvolved clinical and non-clinical faculty within UofT.
- It appears that the Temerty family & T-CAIREM are totally aligned; the family is excited about Professor Mamdani as a leader, the network he has created, and the external validation of what has been created by leaders in the field both nationally and internationally. Although Professor Mamdani expressed concern about spending down the Temerty investment too quickly, there must be recognition that demonstrating the need for the funding will facilitate future philanthropy.

## 6. INTERNATIONAL COMPARATORS

*Assessment of the EDU:C under review relative to the best in Canada/North America and internationally, including areas of strength and opportunities*

- T-CAIREM has already established a national and international reputation as a leader in AI in Medicine and has won international awards for their excellence in the field. The team's efforts to attract trainees from the top universities and their focus on high-quality research and education also indicate that they hold a strong standing relative to international standards.

- T-CAIREM demonstrates the incredible strengths and talent of UofT in the fields of computer science, engineering and clinical medicine.
- It was noted in conversation that other centres internationally may have more funding available to be given out to their researchers. T-CAIREM should evaluate their role as a funder of (catalytic) research and how much emphasis to give to this activity if they have limited budget to spend this way.

## FORMAL RECOMMENDATIONS

We have the following recommendations:

1. Crystallize and communicate *within the university and particularly with the TAHSN community and clinical departments* the T-CAIREM product: a pipeline of people who have the expertise to contribute meaningfully to research/work that will develop and deploy AI tools to advance medicine. From what we heard and read, T-CAIREM is best positioned internally as an “enabler”. We believe that this positioning will assist with buy-in across the hospitals and departments, and enhance capacity for delivery of educational initiatives and research through this enhanced engagement.
2. Expand capacity for leadership within the education theme. This may not be feasible by relying on existing faculty within the university but may require recruitment from outside the university. The chairs of the clinical departments with whom we met indicated their interest in and capacity to recruit such individuals.
3. Wherever possible, advocate for the TAHSN CEOs to recognize cross-hospital data-sharing as critical to our academic success as a group and direct their legal advisors to develop and implement a plan for enabling this.
4. Consider opportunities for matched funding for research (departments or hospitals with TCAIREM) that promotes conduct of studies that align broadly with barriers to effective clinical care, e.g., use of AI scribes to reduce clinical faculty administrative burden.
5. Clarify the role and value of the Health Data Nexus – to be used to facilitate education and/or for use in research and/or to enable existing data to become open source? This will help to clarify whether additional datasets are required and, if so, what might be required to garner interest from owners to submit.
6. Financial sustainability: given what appears to be strong support from the donor, T-CAIREM should develop a clear plan for a follow-up ask that will help supercharge its growth. Other revenue generating ideas may divert T-CAIREM’s attention from its core mission.

We hope this summary and our recommendations are useful.

Yours sincerely,

Timothy  
Chan

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