

Artificial Intelligence and Machine Learning: What is the Role of Social Workers, Occupational Therapists, Audiologists, Nurses and Speech Language Pathologists According to Academic Literature and Canadian Newspaper Coverage?

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ABSTRACT

Artificial Intelligence/Machine Learning (AI/ML) increasingly influences products and processes used by social workers, occupational therapists, audiologists, nurses and speech language pathologists (health professionals for short) in general and in their rehabilitation practice. Health professionals are expected to fulfill many roles and within the narrative of AI/ML health professionals can hold multiple roles. We performed a scoping review using the academic database *Scopus*, the 70 databases accessible through *EBSCO-Host* and the database *Canadian Newsstream* through which we accessed 300 Canadian English language papers as sources. We found minimal engagement with the roles of the covered health professionals related to AI/ML whereby nurses were covered much more than the other health professionals. The main role mentioned for all occupations covered in our study was the one of clinical user. Many other roles expected from health professionals such as being advocates for their field and clients or being policy developers, educators and researchers were rarely or not at all mentioned depending on the health professional. Our role narrative analysis of AI/ML related to the covered health professionals reveals significant gaps in need to be filled.

CCS CONCEPTS

• Social and professional topics • Social and professional topics~Socio-technical systems • Applied computing~IT governance

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KEYWORDS

artificial intelligence, nurses, occupational therapists, speech language pathologists, audiologists, role, governance

1 INTRODUCTION

Artificial intelligence (AI) and machine learning (ML) are applied to many different scientific and technological products and processes that are used by social workers, occupational therapists, audiologists, nurses and speech language pathologists (now called health professionals for short) in their rehabilitation practice. Cochlear implants, personalized medicine, medical diagnostics, big data, virtual reality, neuroimaging, brain computer interface (BCI), deep brain stimulation and transcranial magnetic stimulation are just a few applications influenced by AI/ML that health professionals use in their rehabilitation practice. More and more countries have AI/ML related strategies [13] and an extensive literature on the potential implications and governance of AI/ML advancements exists [2; 15; 17; 19; 24; 25; 27]. One main focus of AI/ML strategies and AI/ML governance discussions is the involvement of stakeholders in decision making processes around AI/ML advancements [14; 16]. The health professionals covered have a stake in how AI/ML products and processes are advanced given the many AI/ML influenced products and processes they encounter as part of their work including rehabilitation focused work and should be actively involved in AI/ML advancements in many ways. Health professionals are expected to perform many roles, (for Canadian Associations representing the health professionals covered see [4-8; 26]). According to the organization *Speech-Language & Audiology Canada (SAC)*, the role of these practitioners includes clinical service, being an advocate for their field and their clients, and being educators and researchers [26]. According to the *Canadian Nurses Association* and the roles range from providing clinical care to applying evidence-informed literature, participating in research, advocate for their clients and their field, being a

team player and being involved in political processes [6-8]. "Nursing is a practice discipline and it is a political act" [7]. *The Canadian Association of Social Workers (CASW)* lists many roles that social workers have in general and in relation to their specific work profile [5]. For social workers involved in physical rehabilitation the roles mentioned include: advocate on an individual and systemic level, researcher, educator of students and community groups and learner [5]. According to the *Canadian Association of Occupational Therapists*, the roles of occupational therapists include being an expert in enabling occupation, communicator, collaborator, practice manager, change agent, scholarly practitioner and professional [4]. Given the role expectations of the health professionals covered, the fact that they have a stake in how AI/ML are advanced and governed and given that involving stakeholders is an important aspect of AI/ML strategies and AI/ML ethics and governance discussions, we explored what roles of health professionals are linked to AI/ML advancements in the academic literature and Canadian newspapers. The research question was: What roles of social workers, occupational therapists, audiologists, nurses and speech language pathologists (health professionals for short) are evident in the AI/ML coverage in the abstracts of academic literature and full text of Canadian English language newspapers?

2 METHOD

2.1 Study Design

A modified scoping review drawing from Arksey and O'Malley [1] was chosen as the most appropriate for the study given the research question. Scoping studies allow to identify the extent of research present on a given topic [11; 18; 23] and the current understanding of a given topic. The following study followed in a modified way the stages outlined by Arksey and O'Malley [1], namely: identifying the review's research questions, identifying databases to search, generating inclusion/exclusion criteria, recording the descriptive quantitative results, selecting literature based on descriptive quantitative results for qualitative analysis, qualitative analysis of data, and reporting findings of qualitative analysis.

2.2 Data Sources

There are various relationships between policy development and academic research [28]. The roles of health professionals evident in academic literature could be one factor in policy development and action around role expectations of health professionals outlined by their professions. Two academic databases were searched, namely EBSCO-HOST, an umbrella database that includes over 70 other databases itself and Scopus, which incorporates the full Medline database collection, with no time restrictions. We chose these two databases because together they contain

journals that cover a wide range of topics from areas of relevance to answer the research questions.

The Proquest online database *Canadian Newsstream* was used as a source, to access over 300 English Language Canadian newspapers, for its complete time range from 1980 to April 2019. We investigated newspapers because the roles of health professionals that are visible to readers of newspapers in relation to AI/ML can influence the readers perception of the health professionals and actions health professionals and their associations should or might take. Furthermore Canadian newspapers were chosen because (a) existing and potential health professionals are readers of newspapers, (b) the database covers over 300 news sources from all regions of Canada, (c) over 75% of Canadians still read newspapers [21; 22] and as such are influenced by what they read and (d) parents, teachers, and career counselors who often give advice on career ideas to young adults also are readers of newspapers [10].

2.3 Data Collection

On September 2018 (data not shown) and April 27th, 2019 a two-step search strategy was employed for the full text of newspaper articles and abstracts of academic literature: Step 1: We searched for the presence of the terms "AI", OR "machine learning" OR "artificial intelligence". Step 2: Within the obtained results we searched for the presence of the selected terms a) "social worker*" OR b) "occupational therapist*" OR c) "nurse*" OR d) "speech language" OR "speech therapist*" OR "audiologist*". After elimination of duplicates we found 441 abstracts and 793 newspaper articles which we downloaded for qualitative content analysis.

2.4 Data Analysis

A thematic qualitative content approach was employed to answer the research questions. By reading the content of the academic abstracts and the newspaper articles mentioning social workers, occupational therapists, speech language pathologists, speech therapists, nurses and audiologists we identified content that suggest a given role for the covered health professionals in relation to AI/ML directly or AI/ML influenced product and processes. We gave each role a specific code and tallied up the incident of any given code. All authors performed the coding to increase reliability, and differences were resolved through peer debriefing.

2.5 Limitations

We limited the search to two academic databases and English language academic literature. As such, the findings are not to be generalized to the whole academic literature, non-academic literature, or non-English literature. Furthermore, the focus of this study was on Canadian newspapers. Sources such as social media or online-only news content (e.g., the Canadian Broadcast Corporation) were not the focus, and therefore were not included. Finally, the focus was on English-

language newspapers only. Therefore, the results cannot be generalized for media in general, newspapers in Canada, and media including newspapers from other countries.

3 RESULT

3.1 Academic Literature

Within the abstracts downloaded we found 94 abstracts indicating roles for nurse, 9 each for social workers and audiologists, 7 for speech language pathologists, 6 for speech therapists and 5 abstracts for occupational therapists.

As to the role narrative, the usage of AI products and processes as part of their work was the most commonly mentioned role in the abstracts namely in 39 for nurses 8 for social workers whereby one abstract indicated resistance to being a user, 5 for audiologists 2 for occupational therapists, 2 for speech therapists and 1 for speech language pathologists.

The second most mentioned role was being impacted by AI/ML advancements in relation to job security, namely in 11 abstracts for nurses (some job roles replaced but other added new, n=7; not negatively impacted, n=3; negatively impacted, n=2), 1 abstract for social workers (not negatively impacted), 1 for occupational therapists (OT not negatively impacted but clients might be [20]), 0 for audiologists, 0 for speech language pathologists, 0 for speech therapists.

As to other roles, **for nurses** we found: 9 abstracts mentioning nurses as learners, 8 Research participant, 5 Researcher, 3 abstracts mentioning the role of Barrier for ML development, being an expert and being a developer of products, 2 Leader, 1 policy developer. One specific role for nurses present in 18 abstracts was being targeted by scheduling software. Advocacy was indicated in one abstract with the authors pushing for nurses to shape clinical practice and to design the future [9]. As to **audiologists**, 5 of the 9 abstracts mentioned the role of using the Fitting Outcomes Expert (FOX) system. One abstract from 2018 covering **occupational therapist** stated "It is recommended that occupational therapists engage with disciplines beyond current typical connections, as our expertise is called upon to advocate for ourselves and our clients who are end users of these technologies" [20] indicating that being involved in governance might be one role although it was not directly stated.

The following roles were not mentioned for any of the health professionals: being a "knowledge producer" on the social implications of AI advancements and the role as an educator on AI advancements.

3.2 Newspapers

Within the newspaper articles downloaded we identified 62 articles indicating roles in relation to AI/ML content for nurses, 12 articles for social workers, 3 articles for

audiologists, 1 article for speech therapists and no article for speech language pathologists and occupational therapists.

As to specific roles to **nurses** being the user for their job and their clients of AI/ML and linked products and processes was the role mentioned the most (n=25), such as using the AI/ML linked expert decision making system and the use of robots. As to the user role one article indicated that they should be users but are not, and two articles that they are users in their role as learners. Fourteen articles mention the role of being impacted by AI/ML and automatization with eight stating that nurses will not be replaced by it such as by robots. Two stated that robots could replace nurses. Four articles indicated that some jobs done by nurses will be taken over by AI/ML products and processes but that other jobs open up for nurses linked to such AI/ML. Although, the role of nursing might shift giving nurses better roles and eliminate task seen to be better done by others. Other roles mentioned were: expert (n=2) and knowledge worker, (n=2).

Social workers were mentioned as expert (n=1), as user of big data (n=1) and ten articles discussed whether social workers are impacted by AI/ML product and processes whereby all ten stated that social workers are safe from being replaced by AI/ML linked automatization.

As to **audiologists**, the roles mentioned were twice as expert, making hearing aids better and one stating that audiologists are safe from automatizations.

Occupational therapists and speech language pathologists were not mentioned

4 DISCUSSION, CONCLUSION AND FUTURE RESEARCH

Our analysis of the roles of social workers, occupational therapists, audiologists, nurses and speech language pathologists evident in the AI/ML covering academic literature and Canadian newspapers reveals significant gaps. This becomes especially evident when we take into account the goals outlined by the many AI strategies [13], AI/ML ethics and governance documents [2; 15; 17; 19; 24; 25; 27] and the roles proposed for social workers, occupational therapists, audiologists, nurses and speech language pathologists in Canada [4; 6-8; 26]. Although health professionals are expected to have many roles such as clinical service provider, researcher, educator, learner, advocate, policy developer, knowledge contributor to discourses and being impacted by AI/ML, the academic and newspaper coverage is very uneven as to what roles they cover. Both mostly focus on the role of service provider and ignore most other roles, especially the advocacy role and the knowledge provider role for AI/ML policy, ethics, impact and governance discourses.

Academic literature and newspapers have to acknowledge that there is more to health professionals than being service providers. Their content has to reflect the recognition that the

role of health professionals as influencers of and knowledge providers for AI/ML policy, impact governance and ethics discourses is important from the point of a) role expectations of health professionals by their associations, b) AI/ML discourses that see the involvement of stakeholders as important and c) the role academic literature and newspapers supposed to play.

Our findings suggest that the role narrative present in the academic literature and the newspapers covered disempowers the health professionals covered because they are not seen as social actors in AI/ML discourses but merely as users of AI/ML products and processes. Furthermore, the newspaper coverage does not leave the reader with knowledge that would allow them to see the diversity of roles health professionals could have in relation to AI/ML advancements and AI/ML discourses.

Finally, academic literature does not provide best practices and discussions around how to enable the diversity of roles of health professionals covered as expected by their associations. This is especially important for the rehabilitation work of the health professionals covered given that rehabilitation is not only covering clinical services but many other facets as for example listed in the Community Based Rehabilitation (CBR) matrix [29], the contemporary discussions around the scope of rehabilitation and the impact of scientific and technological advancements on the scope of rehabilitation [3; 12]. A change is called for given the goal of AI/ML ethics governance and AI and Society discourses. Our findings suggest an opening for many research projects. Research is called for on investigating needed changes in curricula of teaching future health professionals as well as adding content needed for lifelong learning/professional development. It is also needed to investigate needed changes in how AI/ML curricula deal with health professionals and in how ethics, policy development and governance curricula deal with AI/ML in relation to health professionals. Studies are needed on how to broaden the role of the covered health professionals in the AI/ML discourses and to better understand why the coverage of and engagement with the roles of knowledge producer, advocate and policy developer of the health professionals covered within AI/ML discourses is so low. Increasing the role diversity of the health professionals in the AI/ML discourses will enrich the AI/ML discourses and further benefit clients, health professionals, AI/ML developers, people involved in AI/ML ethics, policy development and governance, and the greater public.

ACKNOWLEDGMENTS

Institute of Neurosciences, Mental Health and Addiction, Canadian Institutes of Health Research no: ERN 155204, in cooperation with ERA-NET NEURON JTC2017

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