The Role of Artificial Intelligence in Palliative Care: Review, Challenges and Open issues.

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ABSTRACT:

The role of artificial intelligence (AI) in our daily lives has been growing. Large volumes of intricate medical data can be analysed by AI algorithms in the healthcare industry, assisting practitioners in making better decisions about patient outcomes, diagnosis, and treatment strategies. Among other uses, AI-powered instruments and systems can be applied to illness monitoring, medical imaging, and medication discovery. These various applications of AI enable researchers and physicians to process enormous volumes of data, spot trends, and generate predictions that are not achievable with manual analysis alone. Consequently, AI holds promise for transforming healthcare delivery and enhancing patient outcomes. The application of artificial intelligence (AI) in palliative care has the potential to significantly improve healthcare delivery, help caregivers, and improve patient outcomes. The purpose of this article is to review the present uses of AI in palliative care, evaluate its possible advantages, discuss the related ethical issues, and look at future directions in this quickly developing subject.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP)

INTRODUCTION:

Artificial Intelligence (AI) is revolutionizing palliative care by providing cutting-edge technologies that enhance professional practice and patients' quality of life. Large volumes of clinical data can be analysed using AI to provide insightful information and support for decision-making through the use of technologies like machine learning and natural language processing. AI has emerged as a potentially useful tool for managing and monitoring pain. Improving patient care through the use of AI-enabled electronic palliative care coordination platforms. According to their research, these technologies can enhance coordination and communication by 23%, which will result in better pain and symptom management. By using machine learning algorithms to analyse pain patterns and suggest tailored actions, these technologies allow palliative patients to manage their pain more effectively and with greater initiative. [1] [2].

The accuracy of healthcare choices can sometimes be increased by up to 30% thanks to AI-based decision support systems' ability to analyse vast amounts of clinical data and offer evidence-based suggestions. In palliative care, where choices frequently require weighing several intricate considerations, this is very helpful. Potential Advantages: One of AI's most important contributions to palliative care is data-driven personalization of care [3] [4].

In medicine, machine learning methods can improve the precision of diagnosis and treatment, with possible uses in palliative care. Large clinical information can be analysed by AI algorithms to find patterns and trends that human doctors would miss, enabling more individualized and efficient treatment. According to studies, using AI systems to personalize treatment can enhance clinical results by as much as 20% when compared to more conventional methods [5].

AI has also shown great promise in lessening the effort of medical personnel providing palliative care. In order to free up more time for direct patient care, Topol looks at how AI can automate repetitive jobs. AI systems, for instance, can save up to 45% of the time spent on clinical paperwork, which frees up critical time for face-to-face patient interaction. In palliative care, where human contact quality is essential to delivering patient-centred, compassionate care, this is especially crucial [6].

LITERATURE SURVEY:

Personalized Care through symptom management and Prognostic Tools using AI

AI can evaluate patient data to forecast problems or symptoms and provide specialized treatments. Algorithms, for example, can spot trends in pain thresholds or drug efficacy, allowing for accurate modifications.

[1] Novel method for predicting nonvisible symptoms using machine learning in cancer palliative care:

A straightforward technique based on a machine learning algorithm has been created to predict invisible symptoms based on the patient's history and easily evaluate visible symptoms using decision tree analysis. Instead of diagnosing and forecasting the prognosis based on pictures and laboratory data, we distinguished between symptoms that were difficult to objectively detect and those that were easy to assess. Our approach can improve clinical applications using a less complicated method than conventional machine learning research that makes use of molecular biology markers and photos [7].

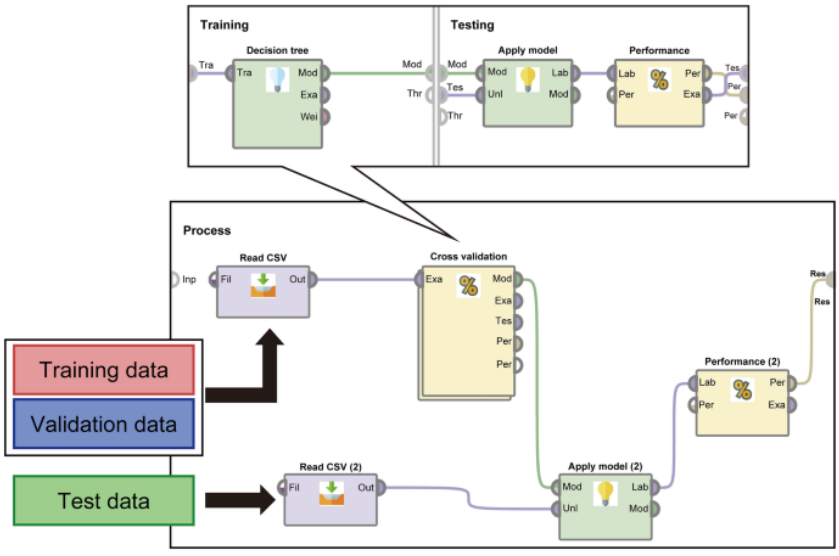

Figure 1: Prediction process for the proposed methodology [7]

The suggested prediction method is depicted in Figure 1, where 53.5% of the patients were male and only individuals between the ages of 33 and 98 (median age of 69) were included. There were several varieties of cancer. There were 75.6% of university hospitals and cancer centres overall, including many patients from institutions that treated cancer as their primary institutional role. The majority of patients were admitted. 32.8% of the patients had an ECOG-PS of 2 or below, 41.8% got anticancer treatment, 40.3% experienced both death and transfer to a palliative care facility, and 67.1% of the patients had an ECOG-PS of 3 or higher. According to estimates, between 32.8% and 41.8% of the patients were in generally good health. In patients with head and neck cancer who have dysphonia, chemo-brain14 side effects from chemotherapy, or poor overall health, patients may be less able to self-report symptoms. To be able to use cues from symptoms that are valid for observation by others to alert patients of the symptoms that they themselves are unaware of, a machine learning-based model that predicts symptoms difficult to assess with common observation based on patient characteristics and symptoms easy to assess was created. All case data was included in the development of the machine learning model since it was believed that the patients' conditions were independent of their capacity for self-reporting. Accuracy, precision, and recall have been used to gauge an ML model's performance. A machine learning model's performance ranges from 80% to 90% in most situations, but in a select few, accuracy of over 96% has been attained. Machine learning models can forecast life expectancy or the course of an illness, assisting families and healthcare professionals in setting priorities for care [7].

[2] Recent advances in artificial intelligence for cardiac CT: Enhancing diagnosis and prognosis prediction.

Recent developments in artificial intelligence (AI) for cardiac computed tomography (CT) have demonstrated significant promise for improving cardiovascular disease diagnosis and prognosis prediction. Radiology has been transformed by deep learning, a subset of machine learning, which makes it possible to automatically extract features and learn from massive datasets, especially in image-based applications. As a result, AI-driven methods have made it possible to analyse cardiac CT scans more quickly than humans can while still ensuring consistency. To properly evaluate the diagnostic efficacy, radiation dose-reduction potential, and clinical accuracy of these AI-driven cardiac CT approaches, more investigation and validation are necessary. Deep learning-based image reconstruction, coronary artery motion correction, automatic calcium scoring, automatic epicardial fat measurement, coronary artery stenosis diagnosis, fractional flow reserve prediction, and prognosis prediction are just a few of the recent developments in AI in cardiac CT that are presented in this review article. It also examines the present limitations of these methods and talks about potential future difficulties [8].

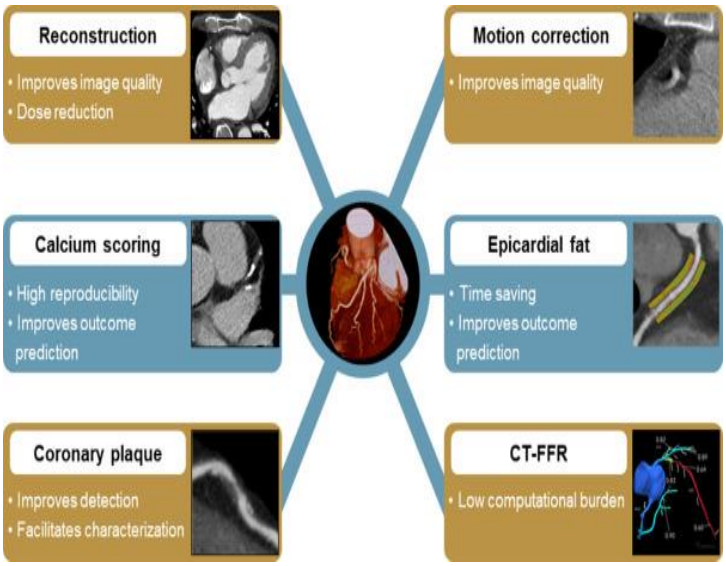

Figure 2: Overview of various applications of artificial intelligence in cardiac computed tomography [8].

Enhanced Decision-Making through Clinical Decision Support and Advanced Planning:

AI systems help physicians select the best care techniques by offering evidence-based suggestions. By forecasting future medical requirements based on a patient's status, AI systems can help with care planning.

[3] Artificial intelligence-based clinical decision support in paediatrics

Clinical decision support (CDS) systems may incorporate machine learning models to identify children who are at risk for particular diagnoses or clinical deterioration and to offer evidence-based interventions. Compared to conventional "rule-based" CDS models in paediatric care, the application of artificial intelligence models in clinical decision support (AI-CDS) may offer a number of benefits, including improved model accuracy, fewer false alerts, and fewer missing patients. In addition to being scientifically sound, AI-CDS solutions must be properly created, offer insight into the reasoning behind decisions, be smoothly incorporated into treatment pathways, be easy to use, and provide answers to clinically relevant queries while respecting the healthcare provider's topic expertise. Even while many machine learning models have been used in paediatric care, AI-CDS has not yet fully included these models. The comparatively lower incidence of clinically important outcomes in children as opposed to adults and the scarcity of adequately big datasets required for machine learning model development are significant obstacles to the use of AI models in pediatric treatment. Key ideas of AI-CDS, its present use in paediatric care, and its possible advantages and disadvantages are outlined in this review article [9].

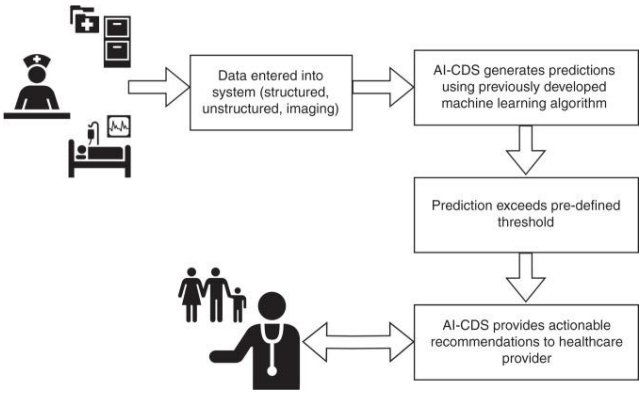

Figure 3: Functioning of an Artificial Intelligence Clinical Decision Support system (AI-CSD) tool [9]

Communication and Emotional Support through Natural Language Processing (NLP) and Sentiment Analysis

Artificial intelligence (AI)-driven chatbots or virtual assistants can answer patients' and families' inquiries and concerns after regular business hours while offering information and emotional support. Artificial Intelligence (AI) can evaluate patient and family conversations to identify emotional distress and trigger immediate human intervention.

[4] Chatbot Performance in Defining and Differentiating Palliative Care, Supportive Care, Hospice Care.

Patients are increasingly turning to artificial intelligence (AI) chatbot platforms for information. Data on these platforms' effectiveness is scarce, though, particularly when it comes to palliative care concepts. The definition and differentiation of "palliative care," "supportive care," and "hospice care" has been assessed for the accuracy, comprehensiveness, dependability, and readability of three AI platforms: ChatGPT, Microsoft Bing Chat, and Google Bard. Six blinded palliative care doctors evaluated the results using a 0–10 scale (10 = best) for accuracy, comprehensiveness, and reliability. The evaluations were randomized. Felsch Kincaid Grade Level and Felsch Reading Ease ratings were used to evaluate readability. ChatGPT, Bard, and Bing Chat had mean (SD) accuracy scores of 9.1 (1.3), 8.7 (1.5), and 8.2 (1.7), respectively; the three platforms had comprehensiveness scores of 8.7 (1.5), 8.1 (1.9), and 5.6 (2.0), respectively; and reliability scores of 6.3 (2.5), 3.2 (3.1), and 7.1 (2.4), respectively. Even while the accuracy was generally high, we found a few significant mistakes (for example, Bard claimed that supportive care had "the goal of prolonging life or even achieving a cure"). Particularly with Bing Chat, we discovered a number of significant omissions (e.g., no mention of interdisciplinary teams in hospice or palliative care). References were frequently untrustworthy. The recommended levels for patient education materials were not met by the readability scores [10].

Benefits of using AI for Palliative care

- Allocation of Resources for Operational Efficiency: AI can optimize palliative care team scheduling, guaranteeing that resources are allocated to patients who require them the most.
- Operational Efficiency through Data Integration: AI systems are able to compile information from multiple sources (such as wearable technology and electronic health records) to present a thorough picture of a patient's status.

- Ethical and Cultural Considerations through Bias and Equity: It's imperative to make sure AI systems are free from biases because algorithms trained on non-representative data may result in discrepancies in care.
- Privacy and Consent: Because palliative care data is sensitive, strong protocols are needed to safeguard patient privacy and guarantee informed consent for AI use.
- Support for Caregivers through Caregiver Burden Reduction: AI can keep an eye on patients' requirements in real time, sending out recommendations and notifications to help caregivers better handle their duties.
- Assistance for Caregivers via Education and Training: AI-based systems can provide clinical scenario simulations or training materials, enhancing the abilities and self-assurance of caregivers.

Challenges:

- Data privacy and scrutiny: Given that the use of AI in palliative care primarily depends on gathering and analysing private patient data, including genetic information, medical history, and test results from laboratory investigations, this raises concerns about patient data security and privacy [11].
- Absence of guidelines tailored to the context: One of the biggest shortcomings is the absence of context-specific guidelines for AI in palliative care in places with limited resources. The ethical issues that healthcare systems in low-resource settings face may not be sufficiently addressed by the guidelines that are currently in place because most of them were created in highly developed, resource-rich environments, taking into account their unique characteristics [11].

Open Issues:

- Absence of Human Touch: AI can improve care, but it cannot take the place of human caregivers' empathy and sophisticated knowledge.
- Complexity and Accessibility: Not all healthcare settings may have the infrastructure, financial investment, and training necessary to use AI systems.
- Encouraging accountability and transparency in AI systems: It is critical that AI systems, particularly those employed in the healthcare sector, operate transparently and provide explicit justifications for the decisions they make [11].
- Ensuring patient autonomy and informed consent: Respecting patient autonomy, which includes the right of patients to make educated decisions about their care, is one of the most significant ethical standards in healthcare worldwide. Clear procedures for gaining informed consent prior to utilizing AI tools in patient care must be developed in order to accomplish this. Patients should be properly informed by these protocols about the data collection, decision-making process, and usage of AI systems in their care [11].

Conclusion:

Palliative care could undergo a revolution thanks to AI, which could increase service quality, efficiency, and personalization. However, to guarantee that its advantages are fully realized while upholding the human-centered aspect of palliative care, cautious adoption, continual assessment, and a strong emphasis on ethical issues are essential. To sum up, AI presents previously unheard-of chances to enhance palliative care; yet, in order to guarantee equitable advantages, ethical and equity issues must be resolved. Our capacity to strike a balance between

technology progress and human values will determine the direction of palliative care in the future.

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