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Enabling Efficient and Accurate Treatment Planning for Oncology Patients with the LinkingMed AiPlan Automatic Radiotherapy Planning System

LinkingMed partners with Intel to help oncologists streamline workloads and improve patient access to care with AI-powered treatment planning.

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About LinkingMed

LinkingMed, located in Tsinghua University Science Park, Haidian District, Beijing, is an artificial intelligence company focusing on the field of radiation oncology therapy. They provide artificial intelligence-based automatic organ delineation, target delineation, automatic radiotherapy planning, radiotherapy quality control, and other technical tools and cloud services for hospital radiotherapy departments and third-party imaging and radiotherapy centers, and provides professional remote collaboration and radiotherapy operation network services for the majority of radiotherapists and physicists based on the Internet and cloud service platforms. LinkingMed is focused on establishing oncology data platform and medical data analysis.

Planning with AI can help practitioners overcome common challenges to cancer treatment for faster, more accessible care.

Cancer is the world's leading cause of death and rates are increasing with each generation.[1] Radiotherapy is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. More than 50% of cancer patients require radiotherapy and it is often used to treat the most common types of cancer such as breast, cervical, and lung cancer.[2] However, millions of patients still struggle to gain access to the treatments they need due to a global shortage of the tools required for radiotherapy—namely the oncologists who prescribe and administer it.[3] In China alone, a staggering 4.8 million new cancer cases emerge each year, and yet only thirty percent of those patients will receive the potentially life-saving radiotherapy treatment they need due to the shortage of experienced oncologists who are unable to effectively manage such a high volume cases. In the United States, nearly half of cancer treatment institutions reported vacancies for oncologist positions in 2018.[4] Another study from AAMC estimates that by 2034 there will be a shortage of between 30,000 and 120,000 primary care physicians overall.[5]

Physician shortages are further compounded by the complexity and time-intensive nature of radiotherapy planning, which significantly limits the number of patients an oncologist can effectively treat. After diagnosing a patient, it can take physicians hours, or even a full workday to create treatment plan. Two medical practitioners must be involved – radiation oncologists and medical physicists – who painstakingly collaborate to determine the best treatment for the patient through a precise dosage of radiotherapy in an exact location of a patient's body. It can take 10 years of training and clinical practice for a physician to develop the necessary expertise to create radiotherapy treatment plans accurately and efficiently. Deploying an AI-powered automatic treatment planning solution with the capacity to generate care plans more quickly can empower oncologists to treat more patients with high levels of accuracy.

There is already precedent for using AI in oncology departments, but it is almost exclusively used for detecting cancer as early as possible.[6] While certainly beneficial, these solutions leave untapped potential for AI in other steps of the treatment process. Even for the few AI solutions that are intended to generate treatment plans, most are only able to accurately prescribe radiotherapy for one or two types of cancers. In addition, there is an absence of AI treatment planning systems which can be scaled for collaboration – limiting their usage to facilities with oncologists on site. An AI solution that allows practitioners to collaborate remotely can bring greater access to radiotherapy for communities in need. These gaps in current cancer treatment planning and accessibility are where LinkingMed's AiPlan for Automatic Radiotherapy Planning comes in.

The LinkingMed Solution

LinkingMed's AiPlan Automatic Radiotherapy Planning System helps create treatments plans for diagnosed cancer patients who have been prescribed radiotherapy by their physicians. The treatment planning system provides a comprehensive set of tools with optimized, built-in algorithms for designing, optimizing, and evaluating treatment plans with a high-level of accuracy. Physicians simply input their patient's data, and the solution generates a complex plan that covers the exact dosage of radiotherapy necessary to treat the cancer, including a timeframe and the ability to target particular tumors.

Unlike other AI-based cancer treatment planning solutions, which are specialized to one or two unique cancers, LinkingMed's AiPlan can treat at least thirty different types of cancer. Therefore, an oncology department can depend on LinkingMed's solution to develop accurate plans for their patients, regardless of where cancer is present in the body, how it has formed, or what stage it is in. In addition, the plan is adaptable to changing situations as and can be easily regenerated. As a patient's condition evolves, practitioners can use the AI solution to revise treatment plans to quickly account for those changes. Typically, this process requires "manual deviation," which refers to the process of a physician manually modifying a pre-established plan. Manual deviation is a critical piece of an oncologist's job yet can be extremely time consuming. With LinkingMed's solution this process can be significantly simplified to optimize physician time and increase access to more patients.

Many hospitals around the world lack oncology departments, and entire communities may be unable to seek the treatment they need simply because there is no access to qualified practitioners. Using the cloud, LinkingMed can provide comprehensive radiotherapy treatment plans to physicians regardless of location by enabling them to share patient data with centers that have oncologists on staff and can leverage the solution. In addition, the connectivity of the solution allows oncologists to collaborate, helping themselves and the artificial intelligence learn from previous cases to improve performance in the future.

Implementing LinkingMed's Automatic Radiotherapy Planning System can significantly streamline an oncologist's workload, enabling them to treat a much greater number of patients, and help improve patient outcomes by drastically reducing the time it takes to develop treatment plans and potentially begin treatment.

Key Benefits

Increases Accuracy by using optimized algorithms and prediction engines that are as precise as plans created by specialized physicians with years of experience

Maximizes efficiency by creating complete treatments plans in minutes, significantly reducing oncologist's workload by allowing them to optimize their time, improve efficiency, and treat more patients

Improves patient experiences by ensuring that patients receive highly accurate plans in a fraction of the time of typical methods, enabling adaptability as treatment progresses, and providing greater access to care across locations

Allows remote collaboration by utilizing cloud connectivity to enable oncologists to work together to drive better outcomes as well as providing vital insights to departments which lack the capability to create treatment plans in house

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## What Sets LinkingMed Apart: Key Capabilities

After diagnosis, practitioners can use the solution to generate an intelligent plan. In approximately sixty seconds, a high-quality plan is automatically generated without manual intervention.[7] This plan includes the AI dose prediction feature that helps streamline processes for patients requiring multiple rounds of radiotherapy. Previously, medical physicists needed prescriptions directly from oncologists before performing any external radiotherapy. Specifically, the oncologist must determine how high a degree of gamma beam radiation they should focus on cancerous structures, being careful to avoid healthy tissues, which can only be exposed to low levels of gamma beams. However, AI trained models can predict what dose is needed enabling faster prescriptions from oncologists that can then be used repeatedly over the course of treatment.

In radiotherapy treatment planning, treatment dose should be carefully administered.

LinkingMed offers a dose calculation engine which allows physicians to complete dose calculations in just few seconds, ensuring physicians can act quickly and improvise if needed with a deviation of less than 0.8 percent.[8]

Another critical function of oncology is determining where radiation must be focused in a patient's body, as cancers can have highly irregular forms, and healthy tissues can easily be accidentally targeted. To solve this problem, LinkingMed offers automatic contouring, which leverages computer vision analysis of CT and MRI scans to separate tumor regions from healthy tissues. This allows practitioners to focus high beams of radiation on cancerous areas, ensuring healthy tissue is not targeted, with a high degree of accuracy. The solution can currently contour for over 140 cancerous structures in ten different types of cancer, including breast cancer, lung cancer and more.

How it works: LinkingMed AiPlan Process
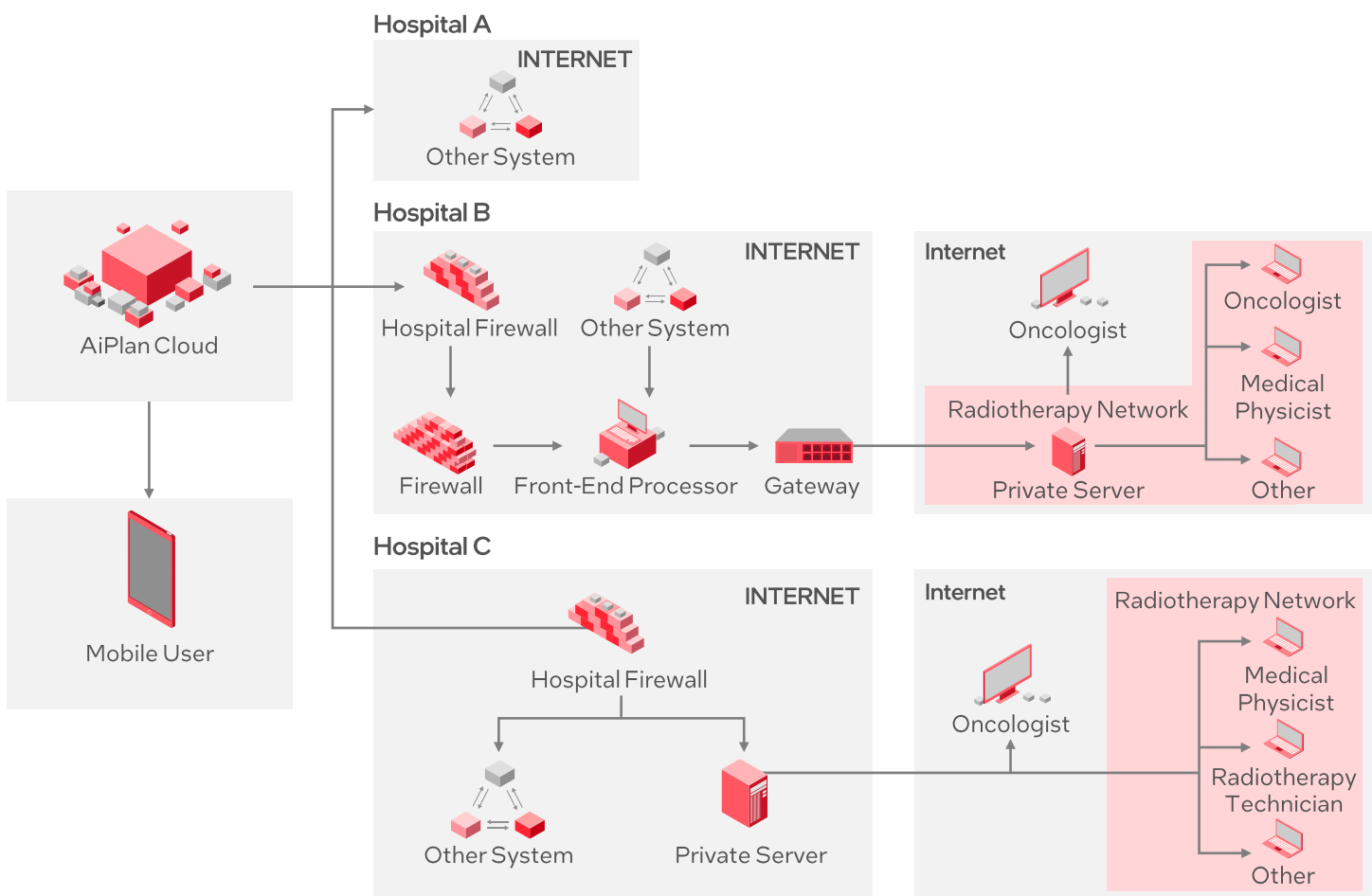
Getting Started with LinkingMed

To generate radiotherapy plans with LinkingMed, users upload their data from hospital equipment into LinkingMed's software for processing and analysis. Patient data from CT and MRI scans goes into the hospitals photo archiving system, and from there the required images can be selected and uploaded to LinkingMed software on either on-premises servers or cloud connections. LinkingMed's software analyzes the images to provide automatically generated automatically generated treatment plans and dose predictions that are then uploaded back into the hospital's archive for use by physicians.

To begin using the solution, users simply need to download the software onto the hardware platform of their choice or integrate it with a cloud service. For on-premises server deployments, Intel® Xeon® processors are recommended for intense inferencing activities, but oncology departments can also use Intel® Core™ processors, depending on the number of patients and the necessary computing power. For cloud-based deployments, customers can integrate the solution software with existing cloud services like Azure. From there, users can login to the LinkingMed portal on any web browser and upload relevant data. This is then analyzed in the cloud and sent back to an intuitive and easy to use online interface where physicians can view their results and confirm them with the system. LinkingMed offers services to advise or help install the solution for end customers.

Intel Technology

Intel® Xeon® Scalable Processors
Intel® Xeon® Scalable processors are a family of high-performance server processors designed for data center and cloud computing applications. They offer advanced features such as multi-core processing, support for high-speed memory and interconnects, and hardware-based security, making them ideal for running enterprise workloads that require high performance, reliability, and security

Intel® oneAPI Analytics Toolkit
Intel® oneAPI Analytics Toolkit is a comprehensive suite of tools and libraries for data analytics and machine learning. It includes popular open-source libraries such as NumPy, SciPy, and scikit-learn, as well as Intel's optimized versions of these libraries for improved performance on Intel CPUs, GPUs, and FPGAs

Intel® Optimization for TensorFlow
Intel® Optimization for TensorFlow is a set of performance-optimized TensorFlow libraries for Intel CPUs, GPUs, and FPGAs. It provides a high-performance runtime and kernel libraries that are designed to take full advantage of the features and capabilities of Intel hardware, resulting in faster and more efficient execution of TensorFlow workloads.

AI Plan's Proven Accuracy

In multi-user studies of 1327 patients across six different institutes, 98% of AiPlan's AI results needed only minor or no revisions to achieve clinical acceptance. The use of AiPlan ultimately reduced physician workloads by 90% at these institutes.[9]

Conclusion

LinkingMed's AiPlan Automatic Radiotherapy Solution has a wide variety of capabilities which help drive better outcomes for patients and increase accuracy and efficiency for oncologists. The solution is easy to implement in a clinical setting and allows collaboration between departments and gives smaller facilities access to critical care with cloud-based deployments. Using intelligent treatment plans, AI dose prediction, and automatic contouring, oncologists can take back time to improve the experiences and outcomes of their patients.

> "AiPlan automatically brings high quality radiotherapy treatment plans with fast dose engines and intelligent generative functions."
>
> **— Chief Medical Physicist, Prominent Hospital in Beijing**

Learn More

- [LinkingMed Website](#)
- [LinkingMed AiPlan RT TPS Product Page](#)
- [AI Partners and Solutions: Intel® Partner Alliance - Intel](#)

- [Intel® Xeon® Scalable Processors Product Page](#)
- [Intel® Optimization for TensorFlow Introduction](#)
- [Intel® oneAPI Analytics Toolkit Product Page](#)

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1. [Researchers report dramatic rise in cancer in people under 50 – Harvard Gazette](#)
2. [New WHO/IAEA publication provides guidance on radiotherapy equipment to fight cancer](#)
3. [Global Radiotherapy: Current Status and Future Directions—White Paper | JCO Global Oncology](#)
4. [Coping With the Shortage of Oncologists](#)
5. [AAMC Report Reinforces Mounting Physician Shortage | AAMC](#)
6. [Artificial Intelligence - NCI](#)
7. [LinkingMed Internal Test Results. Intel does not control or audit third-party data. Please review the content, consult other sources, and independently confirm if the data provided is accurate.](#)
8. [LinkingMed AiPlan RT TPS Product Page](#)
9. [Comprehensive and clinically accurate head and neck cancer organs-atrisk delineation on a multi-institutional study](#)

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