

Modern technology in rehabilitation: Where are we going with them?

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Challenges in patient assessment across healthcare continuum

Within the modern healthcare landscape patients often find themselves navigating through a complex continuum of care, transitioning from acute care hospitals to rehabilitation facilities, and eventually returning home, with some individuals requiring readmission. This journey poses significant challenges, particularly in the realm of patient assessment, where thorough evaluations using high-resolution clinical outcome measures are frequently not conducted due to limited time, availability of clinical staff, and portable resources. The demanding schedules of therapists and physicians often prevent them from conducting comprehensive assessments, potentially leading to gaps in patient care and treatment planning.

Revolutionizing Patient Assessment with Sensor Technology and Computer Vision Technology

In response to these challenges, sensor technology has emerged as a promising solution. By leveraging sensors, healthcare professionals can benefit from unobtrusive real-time data collection, enabling the capture of naturalistic behaviors and the acquisition of objective physiological measures. Over recent years, significant advancements have been made in directly applying sensors to patients, with resulting data seamlessly integrated into the Electronic Medical Record system. These sensors offer the capability to monitor various aspects of patient health, encompassing numerous functions, including complex behaviors eating and speech, thereby facilitating the measurement of conditions such as aphasia and dysphasia. Pioneering work has led to the development of sophisticated machine-learning models aimed at automating the integration of sensor data into clinical dashboards. By automating clinical outcome measures, these models not only streamline the assessment process but also provide valuable insights into functional improvements and predictive analytics, including the identification of recovery prospects and assessment of fall risks. Integration of such sensor data enables the generation of scores for various functional assessments, obviating the need for manual testing procedures and assisting clinicians in saving time.

Another promising solution in healthcare is Computer Vision Technology. Advancements in this field make the analysis of movement patterns possible through easy-to-use portable camera recordings, facilitating real-time predictions and movement analysis. Ongoing research endeavors aim to broaden the application of this technology, encompassing anywhere from early identification of motor delays in infants to the monitoring of disease progression in conditions such as Parkinson's disease through concise video assessments to early warning of falls.

Variability of Exoskeleton Use – Finding the Balance

The integration of robotics, exemplified by exoskeletons, has garnered significant attention for its role in providing substantial support in rehabilitation and mobility assistance across diverse patient populations. Currently, over 100 commercial companies offer various types of exoskeletons, enabling rehabilitation training on the treadmill, overground, and even at home through modular systems supporting single joints, such as Samsung's GEMS-H, B-temia's KEEOGO exoskeletons. When patients reach functional plateaus in conventional training without exoskeletons, incorporating exoskeleton-assisted training can facilitate further improvements. Moreover, these systems not only offer support to patients but can also provide resistance and task complexity, aiding in muscle strengthening or improving motor control. Exoskeletons like the Samsung GEMS-H specifically targeting older adults are a great example for the use outside the clinic by providing support in activities of daily living and enhancing overall quality of life.

Modern technologies play a crucial role in facilitating the assessment and adjustment of therapies in the rehabilitation process according to the individual needs and abilities of patients. However, a critical consideration lies in striking a delicate balance between technology-assisted care and personalized treatment approaches. While technological innovations hold immense promise in enhancing patient care, it is important to ensure that these advancements complement rather than replace traditional methods. The utilization of robotics to address complex patient needs underscores the importance of integrating human expertise with technological interventions. Emphasizing this synergy fosters a holistic

approach to healthcare delivery, wherein the strengths of both technology and personalized care converge to optimize patient outcomes.

Conclusion

In conclusion, recognizing the diverse nature of patient outcomes underscores the importance of embracing robotic technologies as integral components of modern healthcare delivery. Through the integration of sensors, video analysis tools, and robotics, healthcare professionals can conduct more precise and efficient patient assessments as well as better therapies, paving the way for personalized and forward-thinking care strategies. By embracing a balanced approach that harnesses the strengths of both technology and human expertise, healthcare providers can navigate the complexities of the modern healthcare landscape, ultimately ensuring enhanced care and improved outcomes for patients.

References:

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