Optimizing the Management of Medical Information Technology: Best Practices and Innovations

[1] AL Anizi, Nahed Ali, [2] AL Harbi, Talal Mutlaq, [3] AL Harbi, Adel Lafi, [4] AL Harbi, Bandar Zaben, [5] AL Harbi, Rashid Obaid, [6] AL-Azmi, Naif Abdulrahman, [7] AL Harbi, Nader Mahli

[1] Ministry of National Guard Health Affairs, Saudi Arabia, alanizina1@mngha.med.sa
[2] Ministry of National Guard Health Affairs, Saudi Arabia, alharbita10@mngha.med.sa
[3] Ministry of National Guard Health Affairs, Saudi Arabia, alharbyad@mngha.med.sa
[4] Ministry of National Guard Health Affairs, Saudi Arabia, alharbib10@mngha.med.sa
[5] Ministry of National Guard Health Affairs, Saudi Arabia, alharbira6@mngha.med.sa
[6] Ministry of National Guard Health Affairs, Saudi Arabia, alazmina2@mngha.med.sa
[7] Ministry of National Guard Health Affairs, Saudi Arabia, alzaheryna@mngha.med.sa

ABSTRACT

Medical Information Technology (MedIT) has become indispensable in contemporary healthcare, presenting transformative possibilities ranging from improved patient care to efficient hospital management. However, optimizing its potential necessitates a clear understanding and effective management of its multifaceted components. This article elucidates key strategies and innovative practices pivotal for the proficient management of MedIT. Notably, it underscores the significance of streamlined Electronic Health Records (EHRs), emphasizing their customization, accessibility, and mobile compatibility. Furthermore, the article accentuates the growing role of telehealth, especially its versatility in offering both regular and emergency services. The potential of Artificial Intelligence (AI) and data analytics in predicting patient needs, customizing treatments, and real-time reporting is highlighted. Importantly, amidst digitalization, the article prioritizes cybersecurity, emphasizing regular audits, comprehensive staff training, and the need for swift incident response plans. The narrative promotes system interoperability, endorsing universally recognized data protocols and ensuring hassle-free patient data mobility. It also advocates for the continuous professional development of healthcare personnel through MedIT workshops and e-learning platforms. Lastly, it champions patient-centricity by enhancing patient portals with interactive features and real-time communication tools, and by integrating adaptable cloud solutions for better data management.

Key words: MedIT, EHRs, Telehealth, AI in Healthcare, Cybersecurity, System Interoperability, Data Analytics, Professional Development, Patient Portals, Cloud Computing

1- INTRODUCTION

In the intricate tapestry of today's healthcare, the threads of technology weave a transformative narrative, redefining how care is delivered, monitored, and optimized. Medical Information Technology (MedIT) emerges at the forefront of this metamorphosis, melding the rich heritage of medical expertise with the dynamism and efficiency of cutting-edge technology[1]. The profound implications of this merger resonate deeply with both healthcare professionals and patients, heralding a new era where medical procedures are not just facilitated, but fundamentally revolutionized by technological advancements.

Historically, the practice of medicine leaned heavily on direct patient-doctor interactions, tangible records, and localized medical procedures. These processes, while time-tested, often faced challenges in scalability, timeliness, and adaptability. Enter MedIT, and the healthcare sector found itself in the midst of a paradigm shift. From Electronic Health Records (EHRs) that replaced towering file cabinets and paper trails to telehealth platforms breaking geographical barriers, the infusion of technology offered solutions to erstwhile challenges and opened doors to previously uncharted territories[2].

However, this technological influx is not without its complexities. As healthcare institutions navigate the vast expanse of MedIT, they encounter a myriad of decisions — which systems to implement, how to ensure interoperability, the methodologies to safeguard patient data, and the strategies to train medical personnel to adeptly use these tools[3]. The need for guidance and clarity in this rapidly evolving domain has never been more pronounced.

Beyond the mechanics of integration, there lies an even more compelling dimension. The patient experience, once confined to the walls of clinics and hospitals, now extends into virtual consultations, mobile health applications, and wearable

diagnostic devices[4]. This expanded horizon presents both opportunities and challenges. On one hand, patients have more agency over their health, with access to real-time data and remote consultations. On the other, healthcare providers must ensure that this digitized experience retains the human touch, empathy, and quality of traditional medical practices.

It is in this dynamic and multifaceted context that we delve into the depths of MedIT. This article seeks to provide an exhaustive exploration of the current MedIT landscape, offering insights into its myriad components, presenting best practices, and showcasing innovative strategies. From the intricacies of EHR optimization to the promise of Artificial Intelligence in predictive healthcare, from the cyber fortifications essential in the digital age to the importance of continuous professional development in a tech-augmented world, our journey endeavors to equip healthcare institutions with the knowledge and tools to harness MedIT's full potential in a way that is both effective and empathetic.

As we embark on this exploration, it's crucial to remember the core tenet that drives the healthcare sector — the unwavering commitment to patient well-being. With MedIT as an ally, this mission finds new avenues, reimagined strategies, and a future replete with possibilities.

2- INTEGRATION OF EHRs (ELECTRONIC HEALTH RECORDS)

The integration of Electronic Health Records has fundamentally transformed the healthcare landscape. In the past, clinical data was stored in voluminous paper files, requiring significant physical storage space and making retrieval a time-consuming endeavor[5]. With EHRs, this data is now digitized, offering a myriad of benefits that extend beyond mere storage.

One of the most evident advantages of EHRs is the accessibility of patient data. Healthcare professionals can now access pertinent patient information in real-time, regardless of their geographical location, provided they have the necessary authorization[6]. This immediacy not only expedites clinical decision-making but also enhances the accuracy of diagnoses and treatments.

Additionally, EHRs pave the way for enhanced collaboration among healthcare professionals. In multi-disciplinary treatment scenarios, various specialists can concurrently review and contribute to a patient's records, ensuring a holistic treatment approach. This collaborative potential is further amplified by the interoperability features inherent in modern EHR systems, allowing different healthcare systems and applications to communicate seamlessly.

Yet, the integration of EHRs is not just about facilitating medical professionals. Patients, too, stand to gain significantly. EHRs empower patients by granting them access to their health records, promoting an active engagement in their health journey[7]. They can review their medical histories, understand their treatment plans, and actively participate in decision-making processes related to their health.

The customization feature of EHRs also cannot be overlooked. Modern EHR platforms can be tailored to suit the specific needs of healthcare institutions and individual practitioners. This adaptability ensures that the system caters to unique clinical workflows, making its adoption smoother and more intuitive.

Furthermore, the mobile integration capability of contemporary EHR systems is noteworthy. With the increasing ubiquity of mobile devices in professional settings, having EHR platforms that are mobile-compatible ensures that healthcare professionals can access vital patient data on-the-go, making patient care more efficient and timely[8].

While the benefits are manifold, it's also crucial to recognize the challenges that EHR integration can pose. Concerns about data privacy, the need for continuous training due to software updates, and ensuring system resilience against potential cyber threats are all part and parcel of this digital transition. However, with robust strategies in place, these challenges can be effectively addressed, ensuring that the integration of EHRs continues to be a boon for the healthcare industry.

3- TELEHEALTH EXPANSION

In an age where digital technology underpins almost every facet of our lives, healthcare too has seen profound transformation, largely catalyzed by telehealth. Once seen as a niche or supplementary service, telehealth has burgeoned into a central component of the healthcare ecosystem, especially underscored by global events like the COVID-19 pandemic, which necessitated physical distancing and triggered a surge in remote consultations[9].

Telehealth, at its core, transcends geographical barriers, bringing healthcare services to the doorsteps of patients, irrespective of their location[10]. This is particularly salient for individuals in remote or underserved regions, where access to quality healthcare facilities can be sporadic or even non-existent. With telehealth, a patient in a rural setting can consult a specialist in a metropolitan area without the time, expense, and potential health risks associated with travel[6].

The advantages of telehealth are not solely confined to patient convenience. For healthcare providers, it presents an opportunity to optimize their service delivery, allowing them to cater to more patients, especially those who might otherwise not seek care due to geographical constraints. Furthermore, the flexibility telehealth offers can enhance work-life balance for practitioners, as they can offer consultations from their chosen location, be it their clinic, home, or even while traveling.

Moreover, telehealth plays a pivotal role in emergency medical scenarios. Platforms dedicated to urgent online consultations can provide immediate care guidance during critical moments, sometimes making the difference between life and death[11]. It's not just about immediate response; telehealth also facilitates post-operative care and follow-up

sessions, ensuring continuity of care without necessitating frequent hospital visits.

The technological aspect of telehealth has also seen remarkable innovations. From high-definition video consultations that can capture minute details to integrated platforms that can monitor real-time vitals and provide instant diagnostic inputs, the tools powering telehealth are continuously evolving.

Until now, the expansion of telehealth is not devoid of challenges. Technical glitches, privacy concerns, the potential detachment in patient-doctor relationships due to lack of physical interactions, and regulatory hurdles in certain regions can act as roadblocks[12]. Additionally, while telehealth strives to democratize healthcare access, it also poses a risk of excluding those who lack the necessary technological tools or literacy.

The expansion of telehealth symbolizes the convergence of healthcare and technology, redefining the very paradigms of medical service delivery. As with any technological evolution, it's accompanied by challenges. But with a thoughtful, patient-centric approach, telehealth stands as a testament to the possibilities of a digitally-augmented healthcare future.

4- HARNESSING THE POWER OF IA & DATA ANALYTICS IN HEALTHCARE

The contemporary healthcare landscape is awash with data. From patient medical histories to real-time vitals, genomic sequences to epidemiological patterns, the magnitude and complexity of healthcare data are staggering. Enter Artificial Intelligence (AI) and Data Analytics – tools that not only manage this deluge but convert it into actionable insights, revolutionizing healthcare in the process[13].

- **Predictive Analysis:** One of the most promising applications of AI in healthcare is predictive analytics. Using vast datasets, AI can predict potential health issues a patient might encounter, enabling preemptive interventions[13]. For instance, by analyzing a patient's genetic makeup, lifestyle, and historical health data, AI can provide a risk assessment for certain diseases.

- **Medical Imaging:** Machine Learning, a subset of AI, has shown significant prowess in analyzing medical images. From detecting tumors in MRI scans to identifying abnormalities in X-ray images, AI can assist radiologists in making more accurate diagnoses[14].

- **Personalized Treatment:** Every individual is unique, and so is their response to treatment. Data analytics, combined with AI, can analyze a patient's genetics, past health records, and even social determinants to recommend the most effective treatment plans tailored specifically for them.

- **Operational Efficiency:** Hospitals generate a plethora of operational data daily. AI can assist in optimizing hospital operations, from patient scheduling to inventory management. Predictive analytics can forecast patient inflow, helping hospitals manage staffing and resources more efficiently[15].

- **Drug Discovery and Research:** The traditional drug development pipeline is costly and time-consuming. AI can sift through vast amounts of biochemical interactions to predict how different compounds can serve as potential drugs, expediting the drug discovery process.

- **Real-time Monitoring:** Wearable health devices equipped with AI can provide real-time monitoring of patients, analyzing data to alert individuals or medical professionals of any concerning changes, be it a sudden spike in heart rate or a drop in blood sugar.

In conclusion, AI and Data Analytics are not just tools; they are catalysts driving the evolution of healthcare towards more precision, efficiency, and patient-centricity. As the technology continues to evolve, so will its potential, making it imperative for healthcare professionals and institutions to adapt and harness its full potential.

5- CYBERSECURITY REINFORCEMENTS IN HEALTHCARE

In an era of digital healthcare transformation, the sanctity and security of medical data have never been more pivotal. While the digitization of patient records, treatment methodologies, and research data has brought about unprecedented efficiencies and advancements in healthcare, it has concurrently presented a landscape rife with potential vulnerabilities[16].

Cybersecurity in healthcare isn't merely about defending against external threats. It's about safeguarding patient trust, ensuring uninterrupted medical services, and upholding the confidentiality and integrity of sensitive medical data. A breach not only risks financial and reputational damage but can also have grave implications for patient well-being[7].

Recognizing the nature and diversity of threats is foundational. The healthcare sector's rich tapestry of data makes it a lucrative target for cyber criminals. From ransomware attacks that encrypt vital medical data, demanding a ransom for its release, to stealthy data breaches that aim to steal and sell patient information, the range of potential cyberattacks is vast. Routine system audits are paramount. By periodically examining digital infrastructure, healthcare institutions can identify potential vulnerabilities and rectify them before they're exploited[18]. These audits can be complemented by penetration testing, where ethical hackers attempt to breach systems to highlight weaknesses.

Training and awareness among medical staff form the bedrock of cybersecurity. Often, breaches are the result of human error or oversight, such as clicking on malicious email links or using

easily decipherable passwords. Regular workshops and training sessions can equip staff with the knowledge to recognize and thwart potential cyber threats.

Moreover, the importance of updating and patching software cannot be overstated. Outdated software often contains vulnerabilities that can be exploited by attackers. By ensuring that all software, especially Electronic Health Record (EHR) systems, are updated promptly, healthcare institutions can fortify their first line of defense[19].

Backup protocols also play a vital role. Regular and encrypted backups ensure that, even in the event of a ransomware attack, healthcare institutions can restore their data without capitulating to ransom demands.

Collaboration is another key aspect of bolstering cybersecurity. Healthcare institutions should foster collaborations with cybersecurity firms, experts, and even other healthcare providers. Sharing knowledge about threats and best practices can create a united front against cyberattacks.

Lastly, as technology evolves, so do threats. It's essential for healthcare providers to stay informed about emerging cyber threats and adapt their security protocols accordingly.

6- PROMOTION SYSTEM INTEROPERABILITY IN HELTHCARE

Interoperability, in the context of healthcare, refers to the ability of different information systems, applications, and devices to communicate, exchange, and collaboratively use data[20]. In essence, it allows for patient health information to be shared seamlessly across various healthcare settings, regardless of the application or software used. This capability is crucial for ensuring that patient care is timely, appropriate, and consistent across different service providers.

The shift from siloed, institution-specific electronic health records (EHRs) to interconnected and standardized systems has the potential to reshape healthcare delivery profoundly[21]. Here's why promoting system interoperability is of paramount importance:

- **Enhanced Patient Care**: With interoperable systems, a patient's medical history, including diagnostics, medications, allergies, and other vital information, can be accessed by any authorized healthcare provider[22]. This ensures that care decisions are based on a comprehensive understanding of the patient's health status, reducing the chances of medical errors and improving overall treatment outcomes.

- **Efficiency and Cost-Effectiveness**: Duplication of diagnostic tests can be avoided when previous results are easily accessible. This not only reduces costs but also spares patients from unnecessary procedures. Moreover, administrative tasks such as patient transfers, referrals, and discharge become streamlined, enhancing operational efficiency[23].

- **Collaborative Care Models**: Interoperability fosters a more collaborative approach to patient care. Specialists from different disciplines can easily access and contribute to a patient's health record, promoting a holistic and integrated care strategy.

- **Empowering Patients**: An interoperable system allows patients to have access to their medical data across different healthcare institutions. They become more informed and can actively participate in their health and wellness decisions[24].

- **Support for Population Health Management**: By analyzing aggregated patient data from various sources, healthcare professionals can identify trends, risks, and potential outbreaks in populations. This is invaluable for preventive healthcare, resource allocation, and public health strategies.

However, achieving full system interoperability is not without its challenges:

- **Standardization**: Diverse EHR systems have different data structures and standards. Harmonizing these into a universally accepted standard is a significant challenge.

- **Privacy and Security**: With increased data sharing, there's a heightened risk of breaches. Robust cybersecurity measures and protocols need to be in place to protect patient data[25].

- **Cost Implications**: Upgrading or modifying existing systems to be interoperable may entail significant costs, especially for smaller healthcare providers.

- **Stakeholder Buy-In**: All stakeholders, from software vendors to healthcare providers to policymakers, need to be aligned in their vision and commitment to interoperability.

To truly harness the benefits of system interoperability, a coordinated and sustained effort is required. It's a journey that demands collaboration, investment, and a shared vision for a healthcare system that is more connected, efficient, and patient-centric than ever before.

7- CONTINUOUS PROFESSIONAL DEVELOPMENT IN MODREN WORKFORCE

Within the rapidly evolving terrain of medical information technology, the technology itself is only one part of the equation. Equally vital is the human component: the professionals who navigate, implement, and manage these advanced systems[26]. As technology marches forward, it beckons healthcare professionals to keep pace, highlighting

the indispensable role of Continuous Professional Development (CPD) in the realm of medical IT management. Medical IT, with its intricate interplay of databases, digital interfaces, AI analytics, cloud solutions, and cybersecurity protocols, demands a skill set that is both diverse and evolving[27]. Professionals at the helm of these systems aren't merely managing databases; they are orchestrating symphonies of data, ensuring accuracy, security, and accessibility.

Here's where CPD comes into play:

1. **Up-to-date Knowledge**: Medical IT is not a static field. New advancements, software updates, and system integrations emerge continually. CPD ensures that professionals are always equipped with current knowledge, making them adept at navigating the ever-changing digital landscape[28].

2. **Enhanced Skill Set**: Beyond just knowledge, CPD programs can impart specialized skills, be it in cybersecurity protocols, AI-driven data analytics, or cloud management. Such skills can elevate the efficiency and effectiveness of medical IT systems.

3. **Risk Mitigation**: Errors in medical IT management can have grave repercussions, from data breaches to inaccurate medical data[29]. Professionals fortified with continuous training are better equipped to anticipate, identify, and mitigate potential risks.

4. **Optimized Patient Care**: At the heart of medical IT is patient care. When professionals are well-versed with the nuances of the systems they manage, it directly translates to improved patient care. Accurate, accessible, and secure data ensures that healthcare providers can offer timely and informed interventions[16].

5. **Career Advancement**: For the professionals themselves, CPD opens avenues for career growth. With specialized training and certifications, they can ascend to roles of greater responsibility and impact within the healthcare ecosystem.

However, CPD's success hinges on a few critical factors:

- **Relevance**: The training modules and programs should align with the current and emerging needs of medical IT. They should be curated based on industry trends, technological advancements, and anticipated future shifts.

- **Accessibility**: CPD programs should be easily accessible to professionals, be it through online platforms, workshops, seminars, or courses[29]. Flexibility in terms of timing and mode of delivery can enhance participation.

- **Regular Assessments**: For CPD to be genuinely effective, regular assessments and evaluations are crucial. These can gauge the efficacy of training programs and identify areas for further refinement.

In the overarching narrative of "Optimizing the Management of Medical Information Technology: Best Practices and Innovations," CPD stands as a testament to the synergy of human expertise and technological advancement. As the digital dawn in healthcare continues, the continuous growth and evolution of its professionals remain paramount, ensuring a future where technology and humanity coalesce to offer unparalleled patient care..

8- ENGAGING PATIENT PORTALS

The evolution of digital technology has permeated every sector, including healthcare. One of the most transformative digital tools in modern healthcare is the patient portal—a secure online website giving patients convenient, 24-hour access to personal health information[30]. These portals bridge the communication gap between patients and healthcare providers, offering a plethora of benefits while presenting their own set of challenges.

Engaging patient portals enable individuals to access various services such as viewing recent doctor visits, discharging summaries, medications, immunizations, allergies, and lab results. They can also provide functionalities like scheduling non-urgent appointments, requesting prescription refills, exchanging secure emails with healthcare providers, submitting billing and insurance queries, and accessing educational materials[31].

The core essence of an engaging patient portal is empowerment. Empowered patients are better positioned to manage their health and wellness proactively. By having direct access to their medical histories, diagnostic results, and other health information, patients can gain a deeper understanding of their health status. This access promotes self-management, better decision-making, and improved health outcomes.

Furthermore, such portals enhance the efficiency of healthcare delivery. Administrative tasks such as appointment scheduling, prescription renewals, and patient queries can be streamlined, leading to better resource allocation and time management for healthcare providers[6]. This efficiency can also contribute to improved patient satisfaction, as wait times are reduced and access to care is expedited.

Another significant advantage is the promotion of transparent and open communication. With a patient portal, the traditional barriers to accessing one's health records are lowered. Patients can view their information at their convenience, prepare questions for healthcare providers, and take a more active role in their healthcare journey[32].

However, while patient portals offer myriad benefits, their effective implementation and engagement come with challenges:

- **Digital Literacy**: Not all patients are comfortable navigating online platforms. Older generations, in

particular, might face challenges in using digital tools effectively.

- **Security Concerns**: With digital platforms come concerns about data privacy and cybersecurity. Patients need assurance that their sensitive health data is protected from breaches.

- **Data Overwhelm**: The vast amount of information can be overwhelming for some patients, potentially leading to misinterpretation or anxiety.

- **Integration with Existing Systems**: Healthcare providers need to ensure that patient portals seamlessly integrate with existing Electronic Health Records (EHR) systems for consistency and efficiency.

To maximize the benefits of patient portals, healthcare providers must address these challenges[33]. This might involve offering training sessions for patients, reinforcing cybersecurity measures, providing helplines for portal-related queries, and ensuring the portal's user interface is intuitive and user-friendly.

In the broader scope of digital healthcare transformation, patient portals stand as a testament to the potential of technology in enhancing patient care. They embody the shift towards a more collaborative, transparent, and patient-centric healthcare model—a shift that, while challenging, promises better outcomes for all stakeholders involved.

9- EMBRACING CLOUD SOLUTIONS

The healthcare sector, marked by its intricate data structures and the criticality of its operations, has seen a paradigm shift with the integration of advanced technologies[27]. Among these, cloud solutions have emerged as a game-changer in the management of medical information technology. Positioned at the nexus of accessibility and innovation, cloud platforms offer healthcare institutions the ability to optimize, streamline, and redefine patient care and internal operations.

Medical data, ranging from patient histories to real-time diagnostic results, is voluminous and complex[35]. Traditional data storage and management systems often grapple with scalability, real-time access, and data integration challenges. Cloud solutions address these constraints head-on. By migrating to cloud platforms, healthcare institutions can ensure scalable storage, seamless data access from disparate locations, and improved interoperability among various IT systems.

Beyond storage and accessibility, cloud platforms pave the way for advanced data analytics. Integrated with AI tools, cloud solutions can offer predictive insights, enhance diagnostic accuracy, and foster personalized patient care[35]. For instance, a cloud-based Electronic Health Record (EHR) system can integrate patient data from various sources, analyze trends, and offer treatment recommendations based on comprehensive data-driven insights.

However, while the potential of cloud solutions in medical IT is immense, it's imperative to navigate its adoption with prudence:

- **Data Security**: Given the sensitive nature of medical data, ensuring robust cybersecurity measures is paramount. Cloud platforms, while offering advanced security protocols, also expand the potential threat landscape[18]. Therefore, healthcare institutions must employ stringent security measures, conduct regular audits, and ensure compliance with data protection regulations.

- **Regulatory Compliance**: Medical data is often governed by stringent regulatory frameworks, like HIPAA in the U.S. Cloud solutions, especially those that operate across borders, must adhere to these regulations to ensure data privacy and security[36].

- **Integration Challenges**: Migrating from legacy systems to cloud platforms might pose integration challenges. Ensuring data consistency, minimizing downtime, and training healthcare professionals to use the new systems are crucial steps in the transition.

- **Cost Implications**: While cloud solutions often offer cost savings in the long run, the initial transition can be capital-intensive. Institutions need to assess the cost-benefit ratio and plan their budgets accordingly.

In the broader narrative of "Optimizing the Management of Medical Information Technology: Best Practices and Innovations", embracing cloud solutions stands out as a definitive step towards future-ready healthcare. By leveraging the power of the cloud, healthcare institutions can not only streamline their operations but also enhance patient care, ensuring a more connected, data-driven, and innovative healthcare ecosystem.

CONCLUSION

In reflecting upon the diverse spectrum of innovations and best practices in managing medical information technology, it is evident that we stand at a crucial juncture in healthcare evolution. The harmonization of Electronic Health Records (EHRs), the expansion of telehealth, the profound implications of AI and data analytics, fortified cybersecurity, and the essence of system interoperability collectively paint a picture of a healthcare sector that is undergoing a radical transformation.

Medical IT's advancements aren't just technological feats; they represent a paradigm shift towards patient-centered care, where information flows seamlessly, decisions are data-driven, and healthcare becomes a collaborative effort. The move to optimize these technologies signifies more than operational efficiency—it symbolizes a commitment to

improved patient outcomes, enhanced care delivery, and the democratization of health information.

However, as with any profound transformation, challenges are intertwined with opportunities. The journey of integrating these IT advancements requires a holistic approach, factoring in not only the technological dimensions but also the human elements of change management, training, and adaptation.

In conclusion, the optimization of medical information technology is not a mere trend—it is an imperative. By embracing best practices and spearheading innovations, the healthcare sector is poised to offer more responsive, effective, and personalized care. As we navigate this transformative era, the shared vision should be one of continuous improvement, ensuring that technology serves its noblest purpose: enhancing human health and well-being.

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