The COVID-19 Crisis and Its Impact on the Future of Healthcare

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ANOTHER PEARL HARBOR

By all criteria, the coronavirus disease of 2019 (COVID-19) crisis may be the deadliest medical challenge since the Spanish Flu pandemic of 1918. The Spanish Flu infected reportedly about 500 million people worldwide and killed 20 to 50 million, including 675,000 in the United States (US).

With the 24-hour news cycle, the despair of the COVID-19 victims and the grief of family members are transferred to the public instantly. The concern for them is palpable. Recently, I was struck by a novel notion. Enough of the negatives! What good can come from this? As I dove deeper into my thoughts and surveyed my past, it was like witnessing a tsunami of hope for the advancement of mankind.

The virus caught us unprepared, and the circumstances are similar to those that surrounded the attack on Pearl Harbor. There were warning signs of the coming attack well before it happened. General Billy Mitchell warned of an attack on the Hawaii naval base by air and proved it could happen in simulated war games. He was court martialed. On January 27, 1941, Joseph Grew, the US ambassador to Japan wrote, "the Japanese military forces plan to attempt a surprise mass attack on Pearl Harbor." He was ignored, and his warning was classified as a rumor.

There were also warning signs of this coming pandemic. President George W. Bush gave a speech on November 1, 2005, at the National Institutes of Health (NIH) on plans to prevent a pandemic. President Obama, in a speech at the NIH December 2, 2014, warned of a deadly airborne disease and the need to begin to put an infrastructure in place to prepare for a future pandemic that could hit the US in 5 to 10 years. Finally, Bill Gates' TED talk entitled "We're not ready" outlined the details of the "greatest risk of global catastrophe……a highly infectious virus."

The comparison does not end there. More importantly, both Pearl Harbor and COVID-19 placed the US and the world on a war footing. Both were crises that required extraordinary responses. After Pearl Harbor and World War II, the US mobilization of productivity, infrastructure development, and innovation became historically unprecedented. It served as a foundation that established global leadership status in multiple verticals that survives even today. I believe the response to this crisis will assist the future global healthcare system in providing cost-effective, quality care to all.

A DREAM THAT NOW HAS A CHANCE FOR REALITY

In 2000, while a professor of surgery at Yale University School of Medicine, and as part of the NASA/Yale Commercial Space Center led by Ronald Merrell MD, FACS, I was asked to speak at a conference at the World Bank, on the topic of "The Impact of Technology on the Future of Global Healthcare." There, I introduced the *Rosser Doctrine* to address the expanding aging global population, the inadequate healthcare workforce, and the need to establish better, cost-effective, and quality service delivery.

The pillars of the *Rosser Doctrine* include:

(1) Bringing healthcare to the people using telemedicine. Telemedicine is the remote diagnosis and treatment of patients by means of telecommunications technology. It can mitigate the costs, pain, and suffering due to chronic diseases and coming novel healthcare crises in the new century.

(2) Developing cost-effective, miniaturized diagnostic and treatment technologies.

(3) Using innovative, efficient skill and knowledge transfer techniques, including distance learning, computer-based instruction and simulation, and even video game technology, to shorten and improve the quality of training.

BARRIERS TO TELEMEDICINE

My presentation included videos of several telemedicine projects I oversaw in recent years, including teleradiology

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and a wide range of other common applications.[1–3] Additionally, there was a demonstration of pre-op and postop evaluations in both domestic and extreme environments,[4] telemedical oversight of wound care programs,[5] and a real-time dynamic intraoperative consultation.[6] And, finally, telementoring, which comprises the remote training and guidance of a novice surgeon with real-time expert instruction during an advanced minimally invasive procedure.[7–11]

The initial response from the audience was that this was all part of an elaborate dream. I really could not blame them for drawing that conclusion. They could see the advantages of telemedicine, such as increased access and quality of care, a reduction of healthcare costs, improved provider and patient engagement, and satisfaction with the outcomes.[12–13] But they could not see how the monumental barriers to telemedicine could be overcome.

At the time of my presentation, there was very little broadband connectivity. The best that could be done was multiple ISDN lines and satellite communications. No bandwidth, no connectivity, no telemedicine. Furthermore, there was no digital record serving as an information repository that could be accessed anywhere and anytime. And, the concept of such a data bank was plagued by questions of workflow capability and security. The telecommunication systems at the time were extremely expensive and had limited deployment. Finally, there was a lack of reimbursement guidelines, provider licensing issues, and provider and patient acceptance. All these items, to the uninitiated, would seem to be an impenetrable wall blocking the widespread adoption of telemedicine.[14]

COVID-19 CRISIS CRUMBLES BARRIERS TO TELEMEDICINE

Even before the COVID-19 crisis, some of the deadly barriers to telemedicine had already started to come down. Today, widely available, and cost-effective broadband has significantly bridged the connectivity gap, and the service is expected to get better in the future.

We finally have electronic medical records (EMRs) that can embrace customized workflow compatibility with high-grade security. This all came about with the introduction of the Affordable Care Act in the US. Computer applications such as Medici (Medici Technologies, Austin, TX, US), Evisits (Evisit, Mesa, AZ, US), and Simple Practice (SimplePractice, Santa Monica, CA, US) can provide "instant on" telemedicine software infrastructure with standard computing hardware. In addition, standard EMRs are beginning to offer fully integrated telemedical capability.

Since 2000, there are countless examples of successfully deployed telemedicine programs and many Level 1 studies supporting its widespread use.[15–20] However, until the crisis, three formidable hurdles to implementation remained: 1) regulations governing requirements for visits, provider licensing, and approved clinical applications; 2) reimbursements; and 3) provider and patient acceptance of the practice.

With the COVID-19 crisis and nationwide stay-at-home orders, the first pillar of the *Rosser Doctrine* was activated—the need to bring healthcare to the people, and this required telemedicine. It has now become a "must have" instead of a "nice to have" component of the healthcare system.

There now was a mandate to use this approach, and its adoption has expanded exponentially. Physicians, hospitals, and patients resisting telemedicine no longer had a choice. They had to embrace this "new normal." In response, the US Department of Health and Human Services (HHS) eliminated the three-year doctor/patient relationship requirement for telemedicine visits.

They expanded interaction formats that also included telephone visits. Cost-effective broadband platforms like Zoom (Zoom, San Jose, CA, US) and Skype (Microsoft, Redmond, WA, US) were allowed to be used for distant evaluations.

HHS also expanded reimbursement scope and payment levels to parallel those for in-person visits. In a major move, some states, including Florida and California, decided to remove licensure barriers requiring providers to have an in-state license to practice. This is in response to the need for expanded availability of providers where penetrance of the virus was greatest.

OTHER PIECES OF THE DREAM ARE COMING TOGETHER

In spite of the expansion of telemedicine adoption prompted by the crisis, the dream of the *Rosser Doctrine* cannot become a reality with this development alone. There are two other pillars that must be in place. The first is the development and mass deployment of cost-effective, miniaturized diagnostic and treatment technologies. In recent years, these have appeared on the scene and are expanding remote diagnosis and treatment.

Examples abound. There are smartphone applications for performing electrocardiography (EKG), like the Telemedi-

cine Stethoscope (Eko Devices, Berkeley, CA, USA), which facilitates stethoscope audio and EKG livestreaming between patients and providers, or the nifty Kardiamobile 6L (AliveCor, Mountain View, CA, USA), which captures a 6-lead EKG in 30 s using a small, handheld device connected to a cell phone. Blood tests can now be accomplished remotely using devices like the Abbott i-STAT portable blood analyzer or the Abbott Piccolo Xpress chemistry analyzer (Abbott Laboratories, Abbott Park, IL, USA). In the realm of ultrasounds, two innovative companies collaborated to create Lumify (Philips, Amsterdam, NL with Innovative Imaging Technologies, Montreal, QC, CA), an integrated teleultrasound that connects clinicians around the globe in real time. Similarly, the super lightweight Butterfly iQ (Butterfly Network Inc, Guilford, CT, US) offers whole-body ultrasound imaging with a single probe.

Next, the crisis has forced mainstream educators to adopt the routine use of distant learning approaches with video conferencing. Education and training institutions hurriedly began converting all content to an online format, and educators have been put through "crash courses" on how to teach virtually. However, they are quickly realizing that more innovative, efficient skill and knowledge transfer techniques must be used in this medium to engage students and promote maximum learning. This includes the use of computer-based training, simulation, and even video game technology. It is true that all of these approaches have been used before the pandemic but not with a mandate that has dictated rapid, widespread adoption.[21–27] Furthermore, these more effective and efficient approaches could allow training to start at an earlier age.[28–29] To address the shortage of providers, telementoring oversight could expand the capabilities of mid-level providers, allow a new work force addition called telemedical technicians/assistants (medical assistants armed with communication, diagnostic, and treatment technology trained in telemedical protocols), and patients could be recruited and empowered to help take care of themselves. This would introduce a "force multiplier" that expands the healthcare workforce.[30]

A NEW HOPE

Sitting here today, I still remember the sting of the rebuke of my presentation at the World Bank almost 20 years ago. At the same time, I reflect on how I refused to let my dream die. I was buoyed by the writings by Thomas Friedman and Malcom Gladwell. Friedman gave definition and direction to the *Rosser Doctrine*—the goal is to "flatten" (make equal), with technology and new processes, the availability of quality healthcare to all. Gladwell gave me permission to seek to reframe the way we think about the world and our place in it. He also showed me how perceived setbacks and heartaches can make one a valuable player in the advancement of mankind. That's right, even an African American son of the segregated South could contribute to helping the world take a step forward.

I still hear the echo of the words of a quote from Robert Kennedy, spoken when Teddy Kennedy eulogized his fallen brother, "Some men see things as they are and say why, I dream of things that never were and say why not." Since that terrible time in 1968, I have steadfastly held onto those words through my journey. At this juncture in history, the world must cling to those words. We must not lose the momentum that has been generated and retreat to a state of apathy. In the midst of the misery caused by this pandemic, please ponder what can be.

A global pandemic can be the birthplace of innovation and progress. Sometimes, it takes a crisis of this scale to help us realize, as Franklin Delano Roosevelt said in his 1932 inaugural address, "The only thing we have to fear is … fear itself—nameless, unreasoning, unjustified terror which paralyzes needed efforts to convert retreat into advance." A more recent quote by Stanford economist Paul Romer sums up my premise: "A crisis is a terrible thing to waste."

References:

1.   Swett HA, Holaday L, Leffell D, et al. Telemedicine: delivering medical expertise across the state and around the world. *Conn Med.* 1995;59(10):593–602.

2.   Rosser JC Jr. Teacher offers lessons in power of technology. Interview by Bill Siwicki. *Health Data Manag.* 1997;5(4):30–33,37.

3.   Merrell R, Rosser J. Integration of quality programs by telemedicine in surgical services. *Stud Health Technol Inform.* 1999; 64:108–114.

4.   Rosser JC Jr., Bell RL, Harnett B, Rodas E, Murayama M, Merrell R. Use of mobile low-bandwidth telemedical techniques for extreme telemedicine applications. *J Am Coll Surg.* 1999; 189(4):397–404.

5.   Rosser JC Jr., Prosst RL, Rodas EB, Rosser LE, Murayama M, Brem H. Evaluation of the effectiveness of portable low-bandwidth telemedical applications for postoperative followup: initial results. *J Am Coll Surg.* 2000;191(2):196–203.

6.   Go PM, Payne JH Jr., Satava RM, Rosser JC. Teleconferencing bridges two oceans and shrinks the surgical world. *Surg Endosc.* 1996;10(2):105–106.

7. Rosser J Jr., Wood M, Payne J, et al. Telementoring: pushing the telemedicine envelope. *J Assoc Acad Minor Phys.* 1997;8(1):11–15.

8. Rosser JC, Wood M, Payne JH, et al. Telementoring. a practical option in surgical training. *Surg Endosc.* 1997;11(8):852–855.

9. Rosser JC Jr., Gabriel N, Herman B, Murayama M. Telementoring and teleproctoring. *World J Surg.* 2001;25(11):1438–1448.

10. Rosser JC Jr., Herman B, Giammaria LE. Telementoring. *Semin Laparosc Surg.* 2003;10(4):209–217.

11. Rosser JC Jr., Young SM, Klonsky J. Telementoring: an application whose time has come. *Surg Endosc.* 2007;21(8):1458–1463.

12. Zanaboni P, Wootton R. Adoption of telemedicine: from pilot stage to routine delivery. *BMC Med Inform Decis Mak.* 2012;12:1.

13. Haller S. Dialing up telemedicine in Massachusetts, Pioneer Health White Paper No. 172, July 2017:4–7.

14. Scott Kruse C, Karem P, Shifflett K, Vegi L, Ravi K, Brooks M. Evaluating barriers to adopting telemedicine worldwide: a systematic review. *J Telemed Telecare.* 2018;24(1):4–12.

15. Demaerschalk BM, Raman R, Ernstrom K, Meyer BC. Efficacy of telemedicine for stroke: pooled analysis of the Stroke Team Remote Evaluation Using a Digital Observation Camera (STRokE DOC) and STRokE DOC Arizona telestroke trials. *Telemed J E Health.* 2012;18(3):230–237.

16. Lilly CM, McLaughlin JM, Zhao H, Baker SP, Cody S, Irwin RS, UMass Memorial Critical Care Operations Group. A multi-center study of ICU telemedicine reengineering of adult critical care. *CHEST.* 2014;145(3):500–507.

17. American Telemedicine Association. Examples of research outcomes: telemedicine's impact on healthcare cost and quality. Washington, DC: The American Telemedicine Association, April 2013:1–12. Available at amdtelemedicine.com/telemedicine-resources/documents/ATATelemedicineResearchPaper_impact-on-healthcare-cost-and-quality_April2013.pdf.

18. Young LB, et al. Impact of tele-ICU coverage on patient outcomes: a systematic review and meta analysis. *Veterans Rural Health Resource Center Issue Brief #6.* Winter 2011.

19. Palen TE, et al. Comparing virtual consults to traditional consults using an electronic health record: an observational case-control study. *BMC Medical Informatics and Decision Making.* 2012;12:65.

20. Jaglal SB, Haroun VA, Salbach NM, et al. Increasing access to chronic disease self-management programs in rural and remote communities using telehealth. *Telemed J E Health.* 2013;19(6):467–473.

21. Rosser JC Jr., Murayama M, Gabriel NH. Minimally invasive surgical training solutions for the twenty-first century. *Surg Clin North Am.* 2000;80(5):1607–1624.

22. Rosser J, Herman B, Ehrenwerth C. An overview of videostreaming on the internet and its application to surgical education. *Surg Endosc-Ultras.* 2001;15(6):624–629.

23. Rosser J. CD-ROM multimedia-the step before virtual reality. *Surg Endosc-Ultras.* 1996;10(10):1033–1035.

24. Rosser, JC. Playin' to win: a surgeon, scientist and parent examines the upside of video games. *Morgan James Publishing.* 2009.

25. Rosser JC Jr., Lynch PJ, Cuddihy L, Gentile DA, Klonsky J, Merrell R. The impact of video games on training surgeons in the 21st century. *Arch Surg.* 2007;142(2):181–186.

26. Rosser JC, Jr., Gentile DA, Hanigan K, Danner OK. The effect of video game "warm-up" on performance of laparoscopic surgery tasks. *JSLS.* 2012;16(1):3–9.

27. Rosser JC, Jr., Liu X, Jacobs C, Choi KM, Jalink MB, Ten Cate Hoedemaker HO. Impact of super monkey ball and underground video games on basic and advanced laparoscopic skill training. *Surg Endosc.* 2016.

28. Furer S, Alam S, Rosser J. Performance of high school students in a laparoscopic training program." *JSLS.* 2017.

29. Rosser JJ, Legare, TB, Jacobs C, Choi KM, Fleming JP, Nakagiri J. SAGES mini med school: inspiring high school students through exposure to the field of surgery. *Surg Endosc.* 2018.

30. Dall T, et al. 2019 update: the complexities of physician supply and demand: projections from 2017 to 2032. *Report for the Association of American Medical Colleges by HIS Markit Ltd.* April 2019.