

TELEMEDICINE or MEDICAL TELEPRESENCE?

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Similar to virtual reality (VR), telemedicine became a concept so broad that it literally lost its meaning. In VR we have virtual offices that are nothing more than word processing, spreadsheets, graphics, or other forms of software available to the employees working away from their offices. There is nothing *virtual* about it other than substitution of one environment (office) for another (home or remote location). The concept of a broadly accessible, truly virtual, yet readily interactive environment created through advances in computer technology is, with some notable exceptions, nonexistent. In part, this is the direct consequence of continued high prices, inadequate bandwidth to allow remote projection of such environments, and the complexities of interaction between virtual sites¹.

In telemedicine, everything even remotely connected to the practice of the trade becomes both medical and “tele-” as long as the activity is executed over a distance – even if the distance is no further than two floors separating the two sites. Patient data transfer, administrative issues associated with a clinic or a hospital, patient monitoring, or consultation, all become the part of the great, amorphous arena collectively termed “telemedicine,” where distinction between true practice of medicine and the execution of all its supporting activities become increasingly blurred². Unsurprisingly, therefore, there are a considerable number of definitions, all striving to convey the purist definition, and all, invariably, either too broad or too constraining.

Despite great advances in telecommunications, live video technologies that now allow transmission of 3-D imagery, and a number of increasingly sophisticated tools available to the “telephysician,” telemedicine remains very much at the same level of operational sophistication as in the days of its nascence, perhaps even regressed a little. This is, unquestionably, a controversial view. Yet, when the concept was originally developed in 1968 by Dr. K. Bird invented, its main purpose was to provide real-time medical assistance from a Boston hospital to patients at the Boston airport³. Real-time medical assistance was the key element. Today, telemedicine continues to remain largely consultative and static.

While remote consultation is a wonderful thing, there is nothing new about it. Telephone, fax, and radio have been used for decades to serve precisely such a purpose. It is a forgotten fact, but ship-to-shore radio was probably the earliest form of telemedical practice, with medical assistance provided as early as 1906⁴. The progress in teleradiology or teledermatology is more than impressive, and correct diagnoses by highly specialized physicians can be performed on patients located thousands of miles away. However, both disciplines lack the dynamic element and rely on the analysis and interaction with the images *of* the patient rather than interaction *with* the live patient. While the argument of telepsychology can be used to counteract the postulate that modern telemedicine continues its development as a static discipline, telepsychology represent, after all, nothing but video-conferencing used for a highly specialized purpose.

In a show of frustration with the conceptual state of the field, surgeons created the concept of “telesurgery,” and emergency and trauma physicians created emergency- and trauma

telemedicine. These two disciplines embody both the element of real-time presence within the medical environment and an active interaction with it, either by means of remotely controlled devices (e.g., remote robotic surgeon) or by affecting the required actions through voice commands using, for instance, wearable emergency telemedical communication and viewing systems that connect the distant managing physician with the personnel in direct contact with the patient. In either case, a new element has been introduced – that of medical telepresence, whereby the principal remote participant (a physician) conducts medical activities (treatment) as if present on the patient site. Recently performed telerobotic surgery is probably the most sophisticated example of medical telepresence⁵.

The highly powerful concept of medical telepresence can be also applied to medical training, particularly in the arena of training based on simulation⁶. Considering the fact that computerized patient simulators are probably among the most expensive and globally scarce training tools in existence, the development of an Internet-based environment that provides real-time access to- and interactivity of the trainee with the simulator, is a major step forward in utilization of this new technology. It is very likely that in the near future remote, simulation-based training will provide the most effective and wide-spread tool for the continuous maintenance of medical knowledge and skills (i.e. medical readiness). The currently unrealized potential of the concept is operational familiarization of the new generation of physicians, nurses and paramedics with the medium of telemedicine and the involved technology

Remote, simulation-based training encompasses all elements of the original notions of what telemedicine ought to be envisioned as applied to the Boston airport⁷. The remote trainees must address pressing, even potentially lethal medical issues in real time by providing rapid diagnosis, stabilization, and initial treatment, followed by definitive diagnosis and patient disposition. The simulator behaves like a real patient, and its life expectancy may be severely limited as in, for example, cases of heart attack or major trauma. The feel of urgency, the “adrenaline rush” of a medical specialist on the scene of an accident becomes real; the frustrations are palpable; and the need for correct, speedy action is as badly needed as it is in real life. The sense of physical presence at the site of medical emergency is therefore overwhelming and conveys the essence of medical telepresence. The transformation of a static, consultative environment into a dynamically interactive one is not only striking but, more importantly, emphasizes the missing element of the majority of telemedicine operations today – the ability to provide immediate yet remote emergent medical assistance anywhere, any time, and without any other constraint but the resource limitations at the patient site.

There is no doubt that telemedicine will progress in the direction of medical telepresence. The need is growing for urgent and semi-urgent medical care throughout the world; there is the continuous threat of mass casualties resulting from natural and man-made cataclysms; and there is an ever-growing need for increased range of operational skills, particularly among the remote medical workers. All these needs can be eliminated by the transformation of today’s telemedical practices based on the principles of videoconferencing into a dynamic combination of telepresence, telerobotics, and simulation that will ensure, ultimately, a highly uniform level of medical care throughout the world. Even more significantly, it will provide equal access to the best medical expertise that today still remains restricted to the best medical training centers and academic hospitals⁸.

References

1. von Lubitz, DKJE et. al., 2002, , Distance-based medical operations and medical telepresence: new ways of doing the same old thing. Proceedings, ITEC 2002 Conference, Lille, France, April 8 – 11, 2002
2. Introduction to telemedicine (susan-zollo@uiowa.edu)
http://www.bytesforall.org/7th/intro_tele.htmIntroduction to Telemedicine
3. American Telemedicine Association
<http://www.atmeda.org/news/globalsec1.htm>ATA News and Resources
4. George E. Baxter, 1927, The Passing of a Pioneer: some recollections of wireless before it was radio RadioMagazine, April 1927
5. Marescaux,J. et al., 2002, Transcontinental robot-assisted remote telesurgery: feasibility and potential applications. Ann. Surg. 235, 487-926.
6. von Lubitz DKJE et. al., 2001, Autostereoscopy in medical telepresence: the Medical Readiness Trainer experience. Proceedings of HEALTHCOM 2001, 3rd Intl. Workshop on Enterprise, Networking, and Computing in Healthcare Industry (Eds. F. Patricelli, P.K. Ray), Scuola Superiore G. Reiss Romoli, L'Aquila, Italy, June 29 – July 2001, 61- 76, ISBN 88-85280-53-6
7. von Lubitz DKJE et al., 2001, Simulation-based medical training: the Medical Readiness Trainer concept and the preparation for military and civilian medical field operations, Virtual Reality International Conference, May 2001, (Eds. S.Richir, P. Richard, B. Taravel), ISTIA Innovation, 215-224, ISBN 2-9515730-0-6
8. von Lubitz DKJE et al., 2000, Medicine in the Village: technology, health, and the world. In IEEE Proc. "Conf. on Extra skills for Young Engineers" Symposium, B. Vlasovic, A. Cesar, R. Meolic, F.S. Balan (Eds), Maribor Univ. Press., pp. 27-33

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