

THE REVOLUTION IN HEALTH CARE
MANAGEMENT

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ABSTRACT

The Revolution in Health Care Management

Persons living in the first ten years of the 21st Century will witness a revolution in Health Care Management. Defining dramatic change as a revolution implies the effects will reach and impact much of the world's population. This dramatic change is driven by several factors: a graying population, increased longevity, complex health issues, an increasing percentage of the population living at or below the poverty level, the influence of powerful insurance organizations, the increasing efforts of lobbyists on the health care industry, rising government debt and other issues.

This research will examine health care economic issues centered about the changes desired in the education and training of health care management professionals. It will identify several failings as well as selected successes in advanced health care management in the United States of America.

Part One

Introduction

Numerous technological, bio-chemical, biological, electronic, and medical advances have appeared in the health care professions over the past decade and the advances promise to continue at an increasing pace. The changes, innovations and inventions are disparate, with obsolescence sometimes occurring only several months after introduction of an expensive and complex health care system or device. Health care providers are increasingly challenged to understand, train for or otherwise adequately address this surge. Interestingly, coping with this malestrom has so dominated the attention of practitioners that insufficient time and effort remain to address planning for change and attendant consequences for that failure. The accompanying melee associated with this rampaging change engine can only be characterized as a technological revolution.

This research effort will attempt to describe and define the revolution and begin to examine what steps can be taken by Health Care professionals to more rationally address the phenomena.

Background

The early years of the 21st Century will witness a period of rapid change in applications, medications, approaches to disease management and other issues in

healthcare management. This rapid change process is characterized as a Revolution. Defining rapid change as a revolution implies the effects will reach and affect large numbers of the world's population.

The dramatic change process is driven by a myriad of factors. These include the capitalistic want to make profits, and by the obvious opportunity for addition of innovative approaches feeding from inventions e.g., like gasoline development chased the emergence of the automobile and the internal combustion engine.

Other factors may have an even greater influence in the health care revolution. For example, the world's graying population, increased longevity, heightened health problems associated with changing technological structures, e.g., radiation sickness, lung problems associated with polluted air, water, and foods, emerging epidemics like bird flu, tainted beef, Nile virus, and sexually transmitted diseases- especially AIDS, treatment resistant gonorrhea, and sometimes drug related hepatitis A, B, and C.

But complex health issues - folks with more than one serious disease, increasing populations of persons at or below the poverty level, and increasing prices for healthy foods and comparatively lower costs for fast foods which contribute to dietary issues; obesity; and diabetes becomes an increasingly central issue for national health care staffing and costs.

Finally, the period of engaging in aggressive wars with monstrosly explosive devices will find increasing numbers of severely wounded military and non-military persons requiring long term complex care for physical and emotional damage. At the same time those loved ones losing others and assisting the disabled returnees, will

increasingly be entering the system for health needs and psychological and other physical assistance.

Thus it can be shown that multiple factors are fueling the change engine in health care. Extrapolating from the issues cited, the increasing population over the next decades will add volume to the numbers and drive significant change.

NEED FOR THE RESEARCH

Little appears in the literature regarding the aggregate effect of changes in technology in the health care industry. Generally texts in the field seem outdated before reaching the popular market through normal distribution channels. Books on the subject focus on industry segments and do little to show a focus on cumulative effects.

Physicians are interested in their specialty areas, and the sites addressing their disciplines are already crammed full of journal articles. They have little time to assess general trends in technological development. Some information process in a coherent form is needed to keep the wide range of health care providers informed.

Further, except for manufacturer offerings, there is little that provides a central location where parties may get training or education about various applications of a particular process or technological invention or innovation.

A review of the literature in the next part of this study will address this topic.

ABOUT THE RESEARCHERS

John Michaels is currently a professor in the field of management at California University of Pennsylvania. He recently completed his Department Chair duties in the Department of Professional Studies at the Downtown Pittsburgh campus. He was the

initial Chair of that department which was created to house Graduate programs. He researched and created the courses comprising two Graduate programs with emphasis on Management of Technologies and Advanced Health Care Management.

Previously, Dr. Michaels was an Associate Director –Executive Programs, at University of Maryland University College. He served for some time as graduate faculty at Johns Hopkins University where his discipline foci included Transfer of Technologies and Information Systems Management. He taught research methodology at several hospitals and at several universities during his career.

Dr. Michaels is a cum laude graduate of the Doctoral program at George Washington University in Washington, D C. He completed much of his doctoral research for that degree at Stanford University.

Earlier education, degrees and courses were completed at UCLA and American University.

Suzzane Paone is Director charged with responsibility of Information Technologies of University of Pittsburgh Pennsylvania. She has served in senior positions for more than thirteen years. Ms. Paone is completing her doctorate at this time.

SCOPE

This research will embrace several technological areas and will focus on recent technologies and trends affecting principle areas of the Health Care field. Accordingly, the Research Questions in the following paragraphs will indicate the thrust of the research effort and will provide a focus for this abbreviated research study. This paper is directed at an international audience.

RESEARCH QUESTIONS

The following research questions will be addressed in this study:

The primary research question is: What recent major occurrences have characterized the dramatic changes in technologies in the health care industry?

To answer this question several secondary questions must be addressed. These subsidiary questions are:

- What can be learned from a review of the literature addressing innovation, invention and improved systems and processes in selected areas affecting the health care industry?
- How can a research methodology be identified to satisfy the parameters of this study?
- What findings should be evaluated to support this research effort?

Addressing these questions will assist in the attempt to answer the primary research question.

LIMITATIONS

The research activities will review selected literature sources in an effort to identify sources of dramatic or inspired change taking place in the health care profession. Some conversations with practitioners in the field may not be specifically quoted or cited. Not because there is a restriction on the information or knowledge, but because many

utterances may be considered common knowledge or have such small impact or effect as to not be considered necessary in the context in which they are offered.

This research will not attempt to address all aspects of the dramatic changes occurring in every relevant discipline. The intention here is to establish a beginning in the process of identifying if a compendium of improvements in selected aspects of the professions would be of significant value and would be timely. This is not intended to be an exhaustive study.

RESEARCH METHODOLOGY

The research effort in this paper is described more fully in Part 3. However it can be understood here there is little in the way of centrally organized material that would allow for an objective or quantitative study. At this point it may be that a beginning descriptive study is needed to launch the effort.

TIMELINE

This research began in 2004 when a graduate program addressing Advanced Health Care Management was being launched in the United States (1). As a supplement to the course work, the information concerning selected disciplines and trends in those disciplines would have appeared to have a dramatic effect on certain disease categories, namely Alzheimer's disease, stroke and cardio, and diabetes and that knowledge would be necessary to complete certain course work required in the program. The need for the research became increasingly apparent and continued searching in the literature revealed little was available to supplement the needed research required by professionals taking the program.

When this Conference was announced, it provided a venue for conducting research, sharing the study materials with colleagues gathered from Universities around the world, and getting feedback from them regarding the contextual material.

The study was concluded in the late spring of 2005. Amended material was obtained on the advice of colleagues and the paper was concluded for submission in late August 2005.

BUDGET

The monetary resources for this project were supplied exclusively by the researchers. The exception was the financial support for attendance and travel to the conference which was generously provided by Dean Colelli of the Eberly School of Science and Technology and President Armenti at California University of Pennsylvania. It is expected that the total expenditures for this study will approach 10,000 US dollars.

VALUE OF THE RESEARCH

Physicians, nurses, hospital directors, laboratory researchers, biotechnologists, radiologists and other similar professionals will find this work of value as they attempt to plan and budget for training and education of staff, and selves in the exploding technology environment.

Students in micro processor technologies and in microminiaturized applications will find the diverse contents of value as they possibly identify potential users otherwise overlooked.

Manufacturers of advanced equipment- CAT SCAN, MRI,, and other will appreciate the advances which make equipment installed partially obsolete before it can be fully booked.

Others will find the material of value, especially those with persons near to them affected with Alzheimer's disease, stroke-cardio, and diabetes.

DEFINITIONS- GLOSSARY OF TERMS

These are terms used which have no need to be defined with precision for purposes of this broad paper.

Confocal -Provides for multi views and implies in labs the ability to do super focus on some phenomena.

Deculturation -Taking back a part of ones culture and replacing it with another cultural artifact.

Genome- A very tiny part of our DNA makeup.

Melestrom -a bad situation where multi forces contribute to a melee.

Silico- in silico implies work being done on computer models.

Telematics- this information technology term implies the ability to drill ever deeper into data, information and even knowledge.

Zero-yield- example is trying to separate contents of a micro miniaturized cell and find the experiment provides nothing since the cell shifts to morte in the study process.

SUMMARY OF THE FIVE PARTS OF THIS PAPER

Part one of this paper addresses the mechanics of the paper. It describes where material can be found and prepares the reader for the material following. There are thirteen sections in part one which address, especially, the research questions.

Part 2 is the bibliographic section. In this section the results of selected research efforts will be found and the sources of the research are identified.

Part 3 addresses research methodology. This part contains the rationale for the selection of the research methods used in this study.

Part 4 analyzes the information researched and provides the focus which brings together, in summary form, the material selected for study.

Part 5 contains answers to the research questions, summary, conclusions and other detail to conclude the research study.

Part 2, which follows, contains a review of the literature in an effort to answer the specific research question.

Part 2

This section is intended to answer the research question:

What can be learned from a review of the literature addressing innovation, invention and improved systems and processes in selected areas affecting the health care industry?

The effort to find a few hard books on this specific subject provided a zero yield. However, the research process (addressed more fully in Part three) evolved to a literature search covering many sources, from which selections were made. The outcome is addressed below.

The search process included futurist articles, books, texts, and web information. Some material identified on web sites and found in library stacks, provided some insight into the thinking of selected scholars on topics in Health Care.

Population Concerns

“Fiscal pressures associated with aging societies are set to intensify over the next few years ...” according to the 2004, OECD Economic Outlook (1). The book, Gray Dawn: How the Coming Age Wave Will Transform America-And the World; by Peter G. Peterson Times Books. New York. 1999. (4) The Population Reference Bureau projects the 5.0 billion world population to grow to 7.9 billion by 2025 (2).At the same time, UNICEF identifies some 270 million children world-wide with NO access to health care while, by 2010, more than 18 million African children will have lost one or both parents to HIV/AIDS according to The State OF The World’s Children. NY, UNICEF, 2004 (3).

Some, however, paint a glowing picture which seems almost to reflect a romantic novel- lacking substantive references, see *The Progress Paradox: How Life Gets Better While People Feel Worse*. Gregg Easterbrook. New York, Random House, 2003 (5). Easterbrook argues that health care is improving, quality of life in USA is getting better and the rosy picture never subsides.

Futures-Models and Views

A more detailed accounting of trends with careful sourcing is *Futuring: The Exploration of the Future*. Edward Cornish (Editor, *The Futurist*). Bethesda, MD. World Future Society. 2004, (6). In this well- written (text) book, Cornish conceptualizes The Great Transformation described as hyper change and the cybernetic and biotech revolutions. Cornish envisions six super trends shaping the future e.g.,” technological progress, economic growth, improving health, increasing mobility, environmental decline, global warming, and deculturationthis work contains a forty-two page annotated bibliography”.

A lengthy annual report: *State of the World: A Worldwatch Institute Report on Progress Toward a Sustainable Society*. New York. W. W. Norton. 2004. 21st Annual Edition; focused on the consumer society:

“The headlong growth of consumption in the past decade, and the projections that flow from this growth, suggest that the world will soon run into a stark dilemma, with severe impact on water supply, air quality, forests, climate, biodiversity, and human health. Consumption is necessary for survival, but it threatens the well-being of people and the environment when it becomes an end in itself. Nearly all the world’s ecosystems are shrinking to make way for humans and their homes, farms, malls and factories.

Aggressive pursuit of mass consumption leads to poor diets, a sedentary lifestyle, obesity and a decline in social health and happiness. We need to rethink “The good life” and create new political, physical, and cultural “infrastructures of well-being that focus on high quality of life”. As quoted from Abstract of the Month for January, 2004. World Future Society selected Monthly Abstracts (7).

Phase Change

Robertson (8) discusses the effects of phase change- a concept in physics explained by example of water converting to ice- brought about by dramatic changes in technologies.

This implies that a state of nature observed can, at a moment (zero degrees centigrade), place some phenomena we see daily, in a dramatically different light. This can happen in human interaction. For example, some dramatic change in air pollution may at some instant decimate a large population center. Not everything evolves in an orderly or predictable way. Typhoons (hurricanes for North Americans) are another example of a phase change. The weather in that example moves from an orderly progression to a dramatic change, and then returns to its nearly former state as though nothing had occurred. The question is whether such change may come about, or has come about in the Health Care industry? Some would argue (Robertson 2003) that a phase change occurred with the mapping of the human genome—breaking the DNA code. And, that leads to other dramatic breakthrough efforts- the proteome efforts to understand the role of the amino acids coded in the genome, and their potential for altering disease tendencies or improving life expectancy by major bounds. (See Phase Change: The

Computer Revolution in Science and Mathematics. Douglas S. Robertson. New York. Oxford University Press. 2003. (8)

Longevity

Another study conducted by OECD (9), released in late 2004 examines longevity. Many forecasters argue for life expectancies for people living today to exceed 120 years with vigorous health up to 100 years. The study identifies how serious shortcomings in the quality of health care contribute to untimely death, disabilities, poorer health after health care and higher costs. OECD argues that poverty and social exclusion are contributing factors to poor health in populations. Improving the distribution of medicines in correct dosages, better record keeping on health care errors and omissions, and fewer needless surgeries are steps which when taken seriously, will improve health care results and significantly reduce health care costs. Health care which should have been given, but was not, causes a dramatic uptick in costs for that individuals' care at a later date. Similarly, mistakes in the operating room can cause post op care to be triple the cost of the initial operation. The OECD work reinforces others arguments for preventive care and correct diet and exercise as prevention against disease and disability.

(9)Towards High- Performing Health Systems. OECD Health Project Final Report. Organization for Economic Cooperation and Development. Paris. 2004.

Telemedicine

As far as technology applications are concerned, the study can identify, for example, telemedicine, which, according to a 1995 article was in operation at the East Carolina School of Medicine and was being used to assist in health care at prisons, and into other remote hospitals where selected specialties were in thin supply. This

technology has continued to expand and can be found as a practice across national boundaries. There have been examples of telemedicine assisting health care professional in a Central African country and the medical telemedicine assistance being provided from South Africa and from Holland resulting in a child's life being saved. Other dramatic examples are in the literature. (10) FUTURIST. Thomas Blanton and David C. Balch. Telemedicine The Health System of Tomorrow. Pp 14-17. September- October 1995. Bethesda, MD.

Molecular Discovery

In the field of discovery there are numerous indications that technology is outdistancing traditional medicine. For example, recently scientists identified three molecules which may be used in newly developed drugs to inhibit a key perpetrator of Alzheimer's disease. (11) bio.com news. Life Sciences update. July 27, 2005.

Other developments driving the revolutionary changes in Future health care management include advances in genomics research. Recent combinations of software and micro array technology as reported by Cambridge Healthtech Institute leads to identification and localization of disease genes. Other in silico simulation software models drug effects, identifying conflicts and possible reactions during drug development. Even the National Cancer Institute has come up with examples of confocal microscopy providing researchers with novel visualization when studying the biological origins of cellular disorder, especially in cancers.

In this time frame, 2005, the British Government has assisted in the establishment of a public cell stem bank to afford global access to ethically approved stem cell lines. (12) Bio-it world live @bio-itworld.com August 4, 2005.

Threats to a Happy Retirement

But will these advances reach America's retirees, and at what cost? Reportedly, the funding of retirement in the USA is threatened in several ways, e.g.; for civil service workers there is no 'fund'. The retiree's health benefits are paid from this year's tax and other revenues. Many civil organizations-cities, towns and some states could face bankruptcy and retirees benefits may be eliminated or may be sharply reduced. This has occurred with other commercial organizations. The Federal Government lacks funding for the turn over protection of retirees benefits. This and other events threaten to bring added numbers to the uninsured health rolls in the USA. (13) *The Economist*. Editor. Clearly unhealthy. Pp 73-74. July 2nd-8th, 2005.

Human Error Rate

But, the advances in technology can be discounted somewhat after factoring the human error rate. Mistakes occur in the operating room, on the hospital floor, in the air distribution system in health care facilities, and in diagnoses, and post op, postpartum care. Add to errors inherent in the rush to get drugs and devices into the hands of health care professional and it may be a challenge to neutralize this fact. Boston Scientific, for example, pulled its cardiac stent off the market and reworked some problems reported by OR specialists. But as the stent re-entered use, at least three people died as operating room efforts to remove or deflate the wire mesh devices failed. Deflation was reported as one in 10,000; but how could three occur in a short time period? Boston Scientific (\$5.6 billion annual sales) contends that procedures may have been improperly conducted and that technique improvement would have prevented the occurrences which led to death. (14) Sylvia Pagan Westfall. *The Wall Street Journal*. Page A5. July 14, 2005.

Training and Education

Is training and education the answer? Recent conferences (15) Medical Conference, Pittsburgh, PA. July, 2004; gave speakers time to discuss efforts to reduce error and improve quality of health care. The speaker from the training department at Orlando regional Medical Center discussed how their MD peer group was advocating a bonus for MD's with low/zero error rates and penalties for others with any error rate reflecting serious consequences. The Veterans Administration in major centers has focused on error free processes. The VA has improved, dramatically, their quality control.

In the world's largest industry, health care, the key drivers are urged to embrace advancing technology solutions. The American Nurses Association has published standards for health care technology competencies. The American Hospital Association survey, recently completed, identified the 100 most 'wired' University of Pittsburgh (UPMC) is one of the most wired. (16) C. Smith. New Technology continues to invade healthcare: what are the strategic implications/outcomes? *Nursing Administration Quarterly*. 28 (2) 2005.

However, schools and education are not all equal. A recent study presented (2004) at the AACSB conference in Seoul, Korea, identified a plethora of business schools appearing in Russia, the United Kingdom and Germany. But the focus and quality of the educational programs is frequently suspect and fails to address specific management issues centering on technology. The recommendations included the policy makers must address issues to facilitate management education effectiveness in the 21st century. (17) Montgomery, David .Asian management education: some twenty first century issues. *Journal of Public Policy and Marketing*. 24 (1)

According to WHO, there are efforts to improve medical education models. International standards in medical education are a goal of the Institute for International Essential Requirements in Medical Education. (18) Conaboy, K et alle.2005. Central Asian republics: a case study for medical education reform. The Journal of Continuing Education in the Health Professions.

Staying Abreast of the Rapid Changes

The nursing profession is proactive in advancing new technologies. In 2003, an article in Nursing Education Perspectives argued for defining specific nursing roles in the advanced practice of genomics based applied clinical practice. This emerging practice has policy based implications for health services. The researchers noted with dismay, the lack of existing coursework addressing this new technology and science and the implications affecting several health care venues. (19) Lea, D and Monsen, R. (2003). Preparing nurses for a 21st century role in genomics based health care. Nursing Education Perspectives, 24 (2) 75.

The Veterans Health Administration National Quality Scholars fellowship Program is a post residency fellowship which focuses attention on ongoing improvement in health care. The study addresses the need for the physician community to be the fundamental part of any broad based health care revolution. Peer review is a key attribute of this program. The traditional physician culture will be challenged by this effort to improve health delivery locally and in the global community. (20) Batalden, P., Stevens, D., and Kizer, K. (2002). Knowledge for improvement: who will do the learning? Quality Management in Health Care. 10 (3), 3.

Improving Results

The trend toward improving results must accompany the revolution in health care according to an article addressing patient safety initiatives. In 1999 the Institute of Medicine, Washington, D C., estimated 98,000 deaths annually from medical errors. Since then Congress introduced the 21st Century Health Information bill. The Verans Administration has responded with a serious quality improvement program, hospitals have placed patient safety on the front burner and organizations have pushed for all physicians to practice the CPOE (Computerized physician order entry) to reduce errors in written orders. Progress is not as rapid as hoped and CIO leadership will play an important role in broadening participation in CPOE and quality improvement campaigns. (21) Hagland, Mark. Safety in numbers. Pages 26-29. Healthcare Informatics. 22 (8). August, 2005.

This part has identified books, texts, and journal articles addressing the revolution in health care. The section examined articles from 1993 to late July, 2005. In the next section the researchers will address the choice of research methodology. In Part four the material in the work will be summarized.

Part 3 Research Methodology

This section of the research paper will address the subsidiary research question:
How can a research methodology be identified to satisfy the parameters of this study?

Process

The researchers in this study approached their topic from a broad base. The thrust of the investigation centered on identifying texts, and other factually written books addressing the topics of dramatic change in the Health Care industry or professions. No one central source appeared to examine the time periods and requisite health care issues.

The researchers then went to broader sources and found few small writings which appeared to uncover information on the topic of dramatic change in the health care industry. Again, this area of sources appeared thin. Little could be found which would answer the central question addressed in this research.

Journal Articles

Next, research efforts focused on general articles and journal articles in specific disciplines in seeking to identify the thrust of change in the health care industry. Interestingly, several articles appeared that gave clues to how change was taking place.

These articles, recently published, contained material which suggested that change was occurring and that the impact of change would be significant. Now, with that taste of results, the researchers then approached various technical and discipline specific professional journals for information and knowledge. This broad approach then favored a discovery process which can be defined as a Descriptive

Methodology. This one approach would favor finding sources of information and culling from those sources, the knowledge about the subject required to answer the primary research question.

Accordingly, the researchers selected many sources of professional journals and even some trade journals for information about inventions, innovations, and new processes for addressing changes in health care. From reading many of these articles, journals and from reading sections of books and texts, the information was aggregated and the material provided in this report was culled and selected. However, much remains to be done in uncovering and reviewing foreign journals and publications, especially from health care related sources in Russia, Germany, France, Costa Rica and the Slovak Republic.

Descriptive Research Method

The answer to the research question appears to indicate the need for a broad Descriptive Methodology; one which can assimilate a range of information and provide a reasonable answer to the central research question.

The next section, Part Four, will provide an analysis of the findings provided in Part 2.

This portion of the paper will address the research question: What findings should be evaluated to support this research effort?

Part 4 Evaluation Assessment

In Part three the literature review brought attention to the concepts of ‘Advanced Health Care’ and ‘Revolution in Health Care,’ terms quoted by writers and researchers in the field and in futurist writings. Notably, the articles reviewed addressed dramatic change and the need for education and training to keep pace with rapid change.

Alzheimer’s Disease

In that part of the research Alzheimer’s disease was cited to show research progress toward identifying cellular biology which can help prepare medications aimed at blocking the development of the disease. Likewise, the stent mishaps which cause death when used in cardio blockage efforts addressed the enormity of the problem in America with over 100,000 such procedures accounted for by the year 2000.

Obesity

Obesity as a national (USA) disease has increased the time and cost associated with treating diabetes, and other health concerns, and remains a major challenge for health care professionals.

The Genome Project

On another note, the attention drawn by the human genome identification project has opened doors to even more and deeper research as research centers probe the make up of the finite group of amino acids contributing to the construction of the genomes. By unraveling this complex mystery researchers hope to identify the markers which tell

which and when diseases may attack the human body (22) Michaels, J. (2003) Advanced Health Care Management: a Proposed Curriculum. ABAS Conference Brussels.

Biotech Progress

Bio tech progress seems to approach a point where a phase change can take place. Concluding research, once revealed to the public, will be the firestorm of the times. There may be a panic rush by persons to acquire some process, procedure or medication which will prolong quality of life and life itself. Selected Futurists hover about the changes in health care dynamics but thought process of the informed and the less informed do not embrace the potential for dramatic change. Such breakthroughs may have the potential for practically closing down the medical physician profession. Excepting for accidents, injuries and other threats to the organism, less need for prescriptions and treatments may result from genetic and bio tech discoveries displacing the MD and many health care professionals. Wealth may buy a higher living standard-- much as conspicuous consumption does in today's world.

Global Graying

There is little doubt from the research that the population is expanding at a more rapid pace than most realize. Accompanying such change is the fear of new diseases developing with changes in human living styles, consumption of natural resources and the proliferation of 'throwaway'.

But the professionals in health care must address their own human error rates and restore trust by improving health care service quality. Can this be done with education? There seems to be major gaps in the training and education agendas –globally. Many countries' citizenry believe they have the best or the ultimate in health care.

But other nations may be working harder and may be more focused on results. And money spent per person on health care in a society may not spell out or correlate with quality of health care. It may be that the health care services are overpriced and under quality standards. So, price may not tell about results.

In essence health care has advanced dramatically since 1993. The human genome project following that time period set off a silent revolution. Biotechnology, DNA discoveries, stem cell promises and the approaching micro physics of health care provide a dramatic timeline pointing to the need to address the revolution in advancing health care dynamics.

In the next Part, conclusions, recommendations and answers to the research questions will be addressed.

Part 5 Conclusions and Recommendations

This Part will examine the answers to the research questions, provide conclusions and recommendations and tell what should be done differently should the research be repeated.

Answers to research questions

The research question: What can be learned from a review of the literature addressing innovation, invention, and improved systems and processes in selected areas affecting the health care industry?

From the literature review it was learned that world population is expanding rapidly. Futurists predict the lack of preparedness for dramatic changes taking place. Economists forecast increasing numbers of children (and adults) with diminishing health care provision. This implies more need for health care in the future as the world provides ever more opportunity for plague, and new illnesses. The review gave examples of poor health care costs as high mortality is attributed to poor quality in medical practice. The need for advanced curriculum in the health care and health care management professions is exemplified by surveys and studies conducted by associations and professions. This is a brief summary and additional supporting material is also found in Part Four.

The research question: How can a research methodology be identified to satisfy the parameters of this study? is answered in Part Three. Succinctly, it appears to require a descriptive study before a quantitative study can or should be conducted. An objective study would be ill-formed until a specific target can be identified.

The research question: What findings should be evaluated to support this research effort? is answered by the comments provided in PART Four. The dramatic changes

taking place in biotechnology, the human genome project and inventions in micro miniaturized technologies addressing DNA, the amino acids making up each genome and other telemedicine technologies argue for expanded study of all these advances and their impact on the health care professions.

Thus the answers to these questions have contributed to answering the primary question: What recent major occurrences have characterized the dramatic changes in technologies in the health care industry? In CONCLUSION, those changes are:

1. The human genome project and the ability of science to identify markers for health and diseases.
2. The proteomics advances which identify the amino acids which make up a genome and the implications of such make up.
3. The advances in medical technologies- telemedicine, telematics, information systems and allied innovations and inventions.
4. The requirement for improved curriculum for health care professionals.
5. The need to develop continuous quality improvement programs at all levels in the health care industry.

These are the major findings from the process of seeking answers to the research questions.

What should be done differently should the research be repeated?

The preferred approach would be to separate the quest into sections: biotech, genome, proteomics, population trends, physics and the health care discovery system, demographic effects, and conduct in the industry. The research should be conducted by a team of at least three persons who would expect to complete a paper of about three

hundred pages. Some part of the study should be a survey of (about) one thousand professionals in the fields asking questions in a Delphi format about the future.

The study should be a full time funded study completed in no more than six months.

Recommendations

The research indicates a dramatic need for improved education, training and heightened awareness of the dramatic changes taking place which are having a profound effect on the health care industry. The industry should form a task force with the charge to identify the processes needed to keep ahead of the dramatic changes taking place in the professions. Of course, this would include the necessary curriculum changes and the research assignments accompanying that curriculum would spearhead the discovery of new knowledge in the specific fields.

Much needs to be done soon or mankind will settle into a 'catch up' philosophy.

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