

A.1 Discussion Papers

What follows are the authors and titles, followed by short summaries, of the Discussion Papers that were made available to help prepare participants for the Workshop; all except for HCT-W1 were submitted and published in 1999. [While for reasons of length these are not provided as part of the hard copy of this Workshop Report, they will continue to be maintained on the Web site at http://www.hctr.be.cua.edu/HCTWorkshop/HCTa_disc-pap.htm, and will be available in hard copy form upon request.]

HCT-W1: William A. Herman, "[Societally Significant Issues in Home- and Self-Care](#) (based on FDA's [Future Trends in Medical Device Technology: Results of an Expert Survey](#),"), 1998.

- This summary of issues is based on an article that provided a key part of the motivation for this Workshop. During the Fall of 1997, the FDA's Center for Devices and Radiological Health (CDRH) surveyed a group of experts to identify major trends anticipated in medical device technologies over the next ten years. This study was performed in support of CDRH's scientific preparation for upcoming generations of products. The fifteen participants included physicians, engineers, healthcare policymakers and payers, manufacturers, futurists and technology analysts. Participants assessed specific trends and identified several broad clinical, scientific, social, and economic trend-drivers likely to be important for the development of new products. The process included numerically-scored questionnaires, in-depth individual interviews, and a group workshop. Participants assessed 21 generic technologies and identified 36 specific examples of product-types expected to undergo significant development. Among the trends identified were developments related to (1) computer-related technologies, (2) molecular medicine, (3) **home- and self-care**, (4) minimally invasive procedures, (5) device/drug hybrid products, and (6) organ replacement/assist devices employing both hardware and tissue-engineered components.

HCT-W2: Jack M. Winters, [A Framework for \(and examples of\) HCT's](#), 1999.

- This overview starts by developing a perspective on the diversity of HCT's (e.g., from sensors of physiological health status to mobility aids to infusion technologies to communication aids to electronic aids to daily living [environmental controls] to everyday products for older adults and persons with disabilities). It then documents some of the rapid growth in this area, and notes that while the driver for the 1990's was third-party payer changes, the likely driver for the next ten years will be the remarkable changes that are occurring as two-way information and telecommunications technologies more fully permeate the home. It then distinguishes between two useful models -- the medical disease model (where the process involves providing care to the patient); and the functional abilities/independence/consumer model (where the process involves providing products and/or services to a client or consumer). It then identifies general considerations that need to be met by technical products that are intended for use in the home (e.g., reliability, ease of use, interoperability, adjustability, serviceability, scalability). Finally, web-based sources for additional information are noted.

HCT-W3: Audrey Kinsella, "[Improved Care for Diabetic Populations: The Need for Telehealthcare and Alternatives to Conventional Care Services](#)", 1999.

- This paper focuses on persons living with chronic disease(s) or conditions, which comprise the largest and neediest of today's home care populations in the U.S. (an estimated 100 million persons). Special focus is on diabetes, particularly non-insulin dependent Type II diabetes, a chronic disease that affects all age groups, and is currently a disease that must be managed over each individual's entire lifetime. The prevalence and difficulties associated with this disease are addressed, as is the estimated cost of treating diabetes. Preventative steps that need to be undertaken daily are addressed, with emphasis on the possible use of technologies that can be brought into the home. These relatively easy-to-use technologies allow for closer monitoring of their daily status, and assistance in guiding them in their daily care (e.g., blood glucose monitoring kits and electronic menu planners). It is noted that much of the development of today's technologies for home care are grappling with ways to address two key emerging trends in the industry—namely, in view of limited budgets, to "do more with less" money, and to encourage and enable patient self management when possible. Developing the appropriate tools and helping

patients to use them regularly and consistently are continuing challenges in the drive toward providing cost effective, long-term care to chronic disease patient groups such as diabetics.

HCT-W4: Audrey Kinsella, "[Infusion Tele-Therapy in the Home: An Alternative Mode of Service Delivery](#)", 1999.

- Home infusion therapies that are delivered via remotely programmable ambulatory pumps (by "tele-infusion") are part of today's emerging trend in home care toward using substituted means of care. This drive toward locating alternate care means is being fueled by factors such as i) earlier discharge of patients from institutions who may require extensive care services (often including multiple infusion therapies; ii) limited budgets of home care agencies for providing more types of care to more needy at-home patients; and iii) a home care industry initiative that is encouraging patient self management, when possible. Accepting or appreciating the value of new technologies in the home requires a marked shift in conventional thought toward the business of home care and caring for needy patients. For example, infusion therapy that is delivered via telecommunications-ready apparatus costs substantially more in the short term than conventionally delivered services. These up front costs dissuade many in the home care industry from investigating the technology's use or value. However, use of the technology has several particular advantages of note. For one, for patients who do well with this technology, there is a sense of greater independence, which many clinicians have reported has translated into better patient self management routines. Increased self management is a longer term goal that has become a clear, practical need in the home care industry in the face of reduced budgets. Technological development of equipment and devices like ambulatory infusion pumps may be looked at as "enabling" patients to be less reliant on expensive, conventionally delivered services. Among the challenges for advancing the use of this technology are ensuring its safety and its ease of use for patients and for clinicians.

HCT-W5: Audrey Kinsella, "[Home care technologies 1999: Movement toward the home as a one-stop healthcare shop](#)", 1999.

- There are at least two important, identifiable trends in the development of the home as a "one-stop healthcare shop" as the 21st century approaches, the one-stop shop referring to multiple and often diverse services delivered to a central location, in this case the home. Foremost among these trends is the development of ambulatory care equipment that is multi-functional and relatively easy to use by home care clinicians as well as by trained laypersons and patients. The second trend is the prevalence of earlier discharge of patients from acute care settings to home during a period when they may still need a variety of regular, often daily, healthcare interventions. The recent availability of equipment that can meet the multiple needs of today's patients has been an important factor in potentially transforming the ordinary household into a one-stop healthcare shop. Consumer preference in large part has begun to drive this development of technology. However, the time has now come to examine the appropriateness of both the technology and its applications for home use by typical home care patient use.

HCT-W6: Steve Warren, Richard Craft, and John Bosma, "[Designing Smart Health Care Technologies into the Home of the Future](#)" -- best viewed as [Word](#) or [PDF](#) file, 1999.

- The United States health care industry is experiencing a substantial paradigm shift with regard to home care due to the convergence of several technology areas. Increasingly-capable telehealth systems and the internet are not only moving the point of care closer to the patient, but the patient can now assume a more active role in his or her own care. These technologies, coupled with (1) the migration of the health care industry to electronic patient records and (2) the emergence of a growing number of enabling health care technologies (e.g., novel biosensors, wearable devices, and intelligent software agents), demonstrate unprecedented potential for delivering highly automated, intelligent health care in the home. This discussion paper presents a vision for the implementation of intelligent health care technology in the home of the future, focusing on areas of research that have the highest potential payoff given targeted government funding over the next ten years. Here, "intelligent health care technology" means smart devices and systems that are aware of their context and can therefore assimilate information to support care decisions. A systems perspective is used to describe a framework under which devices can interact with one another in a plug-and-play manner. Within this infrastructure, traditionally passive sensors and devices will have read/write access to appropriate portions of an individual's electronic medical record. Through intelligent

software agents, plug-and-play mechanisms, messaging standards, and user authentication tools, these smart home-based medical devices will be aware of their own capabilities, their relationship to the other devices in the home system, and the identity of the individual(s) from whom they acquire data. Information surety technology will be essential to maintain the confidentiality of patient-identifiable medical information and to protect the integrity of geographically dispersed electronic medical records with which each home-based system will interact.

HCT-W7: Joe Andrade, "[Chemical Sensors in the Home](#)", 1999.

- Many medical conditions require the measurement of one or more biochemicals in order to facilitate diagnosis, manage a disease or condition, or monitor a treatment. Physicians and other health care providers regularly order a range of chemical tests, generally performed on blood or urine. In the last several decades analytical and clinical chemistry has developed to the point where many useful analytical measurements can be made using relatively simple and inexpensive instrumentation and often by unskilled personnel. Some of these technologies (e.g., quantitative glucose measurement) have now become over the counter, readily available, kits and instruments for home use; yet this is just the beginning. This discussion paper reviews recent progress, and provides a context for what the future may hold.

HCT-W8: Gerald Loeb, "[Telecare: Enabling the Virtual Housecall](#)", 1999.

- The baby boomers are fast becoming feisty old codgers who want to live well, live at home and live forever. Their children agree; they don't want to be nursemaids or pay for nursing homes. Yet they worry about how mom or dad is doing a thousand miles away, what happens if they fall or forget their medications, and how to get them to the clinic for follow-up of their many chronic health problems. The time is ripe to bring together the traditionally balkanized medical device industry and the diverse technologies originally developed for telemedicine to create synergic systems that will meet this urgent and growing demand. What is needed is a powerful but nonpartisan center to focus the discussion among care providers and clients, to act as a clearinghouse for existing technology, to facilitate the emergence of standards for new technology, and to push the envelope of the possible in the direction of the greatest needs. This document outlines the need, scope and possible venue for such a center.

HCT-W9: Jeff Colemann & Anna-Lisa Silvestre, "[Building a Security Capable System](#)," March, 1999.

- This paper presents general principles and case examples of how health care providers can prepare themselves to become data security capable organizations; that is, organizations in which ensuring the security and confidentiality of medical information becomes incorporated into the every day working routine of all staff. Building a security capable organization requires institutionalizing a security surveillance process, not just implementing security measures. Implementing a security surveillance process requires several steps, including: 1) Monitoring the changing legal and regulatory environment; 2) Enhancing patient understanding of the organization's data security efforts, and; 3) Continuously updating data security policies, procedures and practices in light of changing mission. Case examples from *Kaiser Permanente Online*, a members only web site, and Project Phoenix, a telemedicine project from Georgetown University Medical Center, illustrate the general points.

HCT-W10: Janell Duncan, "[Legal and Policy Issues Relating to the use of Medical Devices in the Home, and the Home as a Health Care Setting](#)", March, 1999.

- Home care in the United States is a diverse and growing industry. Similarly, the types of medical devices used in the home varies greatly - from the most simple of devices to very complicated computer operated machinery. Among these devices are those used for home/self monitoring and diagnosis, home/self therapy, and telemedicine. This paper addresses the major legal and policy issues relating to the home as a health care setting, namely: (i) Federal regulation of medical devices used in the home; (ii) Federal reimbursement policies for the provision of home care and telemedicine services; (iii) tort liability concerns; and (iv) access to home care and telemedicine services.

HCT-W11: Kate Seelman, "[Disability's New Paradigm: Implications for Assistive Technology and Universal Design](#)", 1999.

- This discussion paper, by the Director of NIDRR, starts by providing an overview of Assistive Technology (AT) in the United States, and then assesses the implications of the new paradigm in disability research on AT and Universal Design. In 1997, a report commissioned by the Congress entitled *Enabling America: Assessing the Role of Rehabilitation Science and Engineering* was published by the Institute of Medicine/National Academy Press [<http://www.nap.edu/readingroom/books/enabling/>]. This report identified NIDRR as the primary and largest Federal Agency concerned with disability and rehabilitation research and with assistive technology, accounting for approximately half of all federal R&D expenditures in rehabilitation science and engineering (see [<http://www.ed.gov/offices/OSERS/NIDRR/info.html>]). In this paper the author discusses how the USA is currently shifting its perspective towards individuals with disabilities by adopting a "new paradigm" of service and opportunities. Under this new paradigm, the environment of the individual with a disability is seen as the "disabler," and not the person him or herself. The initial paradigm of disability research grew in the field of medicine and was essentially reductive to impairment and condition with an apparent emphasis on sickness and the professional. The new paradigm is more integrative and, while retaining its medical components, is broadened to include many other fields and disciplines. In the new paradigm, there is more of an emphasis on ability of the disabled individual. Success in research, especially medical rehabilitation, has helped to make the new paradigm possible.

HCT-W12: Jack Winters, "[Two Overriding Criteria for Policymakers: Quality of Life and Sustainable Infrastructure](#)", 1999.

- Until this century, doctors and other health providers usually made house calls. Our remarkable move to hospitals and medical centers resulted in surgical capabilities unimaginable in the past, new forms of diagnosis and treatment, the addition of many new professional specialties, greater dependence of technology, and an elaborate third-party reimbursement structure. For most Americans, healthcare became a right, and we expected the best -- quality at all costs. But problems arose: healthcare costs (services, technologies) grew, and centralized episodic care didn't always yield good outcomes; indeed, from a "quality of life" perspective Americans and their lifestyles didn't always seem that healthy. It wasn't sustainable. And the more recent shift toward "managed care" is not without its own problems. The position of this paper is that a sustainable healthcare infrastructure will require rethinking of what, where, how, when and why healthcare services are provided, and a considerably greater dependence on telehealth, consumer-oriented home/self-care solutions, and the concept of wellness. A key criteria is "quality of life" [on both individual (including disabled, disadvantaged) and community (local, national, global) levels]. For healthcare, it is suggested that central to sustainable quality of life are the following: i) a priority on access (for all) to information, services, and assistive technologies (this includes taking universal design/access seriously), ii) convenience (e.g., making distance and time-of-day less of a barrier), iii) profound interoperability between products; iv) outcomes-oriented (and object-oriented) computerized patient records; and v) customized (intelligent) personal assistants.

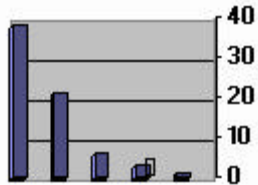
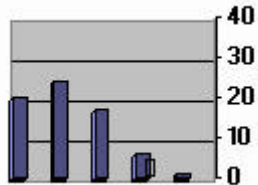
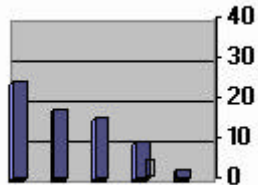
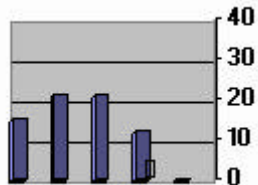
A.2: Vision Statements

Vision Statements. Two types: **i)** anticipated technology/society developments, and probable trends in home/self-care products; and **ii)** desirable future scenarios/outcomes that are achievable. Vision statements are organized by topic area, and ranked based on the collective degree of agreement. (For the three groups providing more than 7 statements, only the top 7 are provided.)

<p>Topic A: Interactive "Home" TeleHealth</p>	<p>Agreement agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>A1: (i) In the future, technology will enable the consumer to access a wide range of health care services from the home</p>	<table border="1"> <caption>Agreement Data for A1</caption> <thead> <tr> <th>Agreement Level</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>48</td> </tr> <tr> <td>2</td> <td>22</td> </tr> <tr> <td>3</td> <td>8</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Agreement Level	Percentage	1	48	2	22	3	8	4	5	5	2
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<p>A2: Home care technologies will enable the integration of the environment and the community to support independent living.</p>	<table border="1"> <caption>Agreement Data for A2</caption> <thead> <tr> <th>Agreement Level</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>35</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>8</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Agreement Level	Percentage	1	25	2	35	3	15	4	8	5	2
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<p>A3: Home care of the future will be supported by an electronic patient record that reflects a comprehensive history and supports continuity of care, while assuring security, privacy, confidentiality and integrity of the data.</p>	<table border="1"> <caption>Agreement Data for A3</caption> <thead> <tr> <th>Agreement Level</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>20</td> </tr> <tr> <td>4</td> <td>10</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Agreement Level	Percentage	1	25	2	20	3	20	4	10	5	5
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<p>A4: (i) Technology applications for health care will emerge from consumer driven lifestyle medicine.</p>	<table border="1"> <caption>Agreement Data for A4</caption> <thead> <tr> <th>Agreement Level</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>10</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Agreement Level	Percentage	1	20	2	25	3	15	4	10	5	5
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<p>A5: (i) The government will take an active role through education, regulation and provision of services that become accepted privately as the standard of care.</p>	<table border="1"> <caption>Agreement Data for A5</caption> <thead> <tr> <th>Agreement Level</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>10</td> </tr> <tr> <td>2</td> <td>15</td> </tr> <tr> <td>3</td> <td>30</td> </tr> <tr> <td>4</td> <td>10</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Agreement Level	Percentage	1	10	2	15	3	30	4	10	5	5
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<p>Topic B: Personal Status Monitoring</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>B1: There will very likely be consumer demand for healthcare products and services that will enable patients to stay well and stay at home</p>	<table border="1"> <caption>Survey Results for B1</caption> <thead> <tr> <th>Response Level</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>22</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>2</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table>	Response Level	Count	1	25	2	22	3	10	4	2	5	1
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<p>B2: Accessible and configurable systems for health and wellness needs. The home-based end of the system should be transparent in the home (i.e., "minimally intrusive")</p>	<table border="1"> <caption>Survey Results for B2</caption> <thead> <tr> <th>Response Level</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>28</td> </tr> <tr> <td>2</td> <td>22</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>3</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table>	Response Level	Count	1	28	2	22	3	10	4	3	5	1
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<p>B3: There should be an integrated system of care, devices, and testing that allows patients to improve their health and to stay in their chosen environment</p>	<table border="1"> <caption>Survey Results for B3</caption> <thead> <tr> <th>Response Level</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>22</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>2</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table>	Response Level	Count	1	25	2	22	3	10	4	2	5	1
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<p>B4: There will be a universal backbone (communications system) through which healthcare transactions will take place</p>	<table border="1"> <caption>Survey Results for B4</caption> <thead> <tr> <th>Response Level</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>15</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response Level	Count	1	30	2	15	3	10	4	5	5	2
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<p>B5: As more developments in home care deliverables become more readily available, there should be options for patients with certain needs (e.g., chronic conditions) to choose among conventional, higher tech, and implantable devices to receive the care that they need.</p>	<table border="1"> <caption>Survey Results for B5</caption> <thead> <tr> <th>Response Level</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>3</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table>	Response Level	Count	1	25	2	20	3	10	4	3	5	1
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<p>B6: How should this system be designed? It should include:</p> <ul style="list-style-type: none"> • An algorithm for assessing patient data that are sent from the home. • Feedback mechanisms for sending customized patient information (sent to the home to improve patient self care • A quality assurance mechanism built into the system 	<table border="1"> <caption>Survey Results for B6</caption> <thead> <tr> <th>Response Level</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>3</td> </tr> <tr> <td>5</td> <td>1</td> </tr> </tbody> </table>	Response Level	Count	1	20	2	25	3	10	4	3	5	1
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<ul style="list-style-type: none"> • Minimal interruptability • Design that allows it to be small and transportable 	
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<p>Topic C: Appropriate Design -- Ethical & Legal Issues</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>C1: Reimbursement policies should not discriminate against home health care, products and services</p>	 <table border="1"> <caption>Survey Results for C1</caption> <thead> <tr> <th>Rating</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>38</td> </tr> <tr> <td>2</td> <td>22</td> </tr> <tr> <td>3</td> <td>8</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Rating	Count	1	38	2	22	3	8	4	5	5	2
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<p>C2: Develop system of "mass customization" that encourages personalized design, adaptable manufacturing and flexible regulation of home care devices</p>	 <table border="1"> <caption>Survey Results for C2</caption> <thead> <tr> <th>Rating</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>22</td> </tr> <tr> <td>2</td> <td>28</td> </tr> <tr> <td>3</td> <td>18</td> </tr> <tr> <td>4</td> <td>8</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Rating	Count	1	22	2	28	3	18	4	8	5	2
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<p>C3: Federal policy and funding should support linking the home to the "information superhighway" to support home health care, including regulations to embed relevant technology in housing design.</p>	 <table border="1"> <caption>Survey Results for C3</caption> <thead> <tr> <th>Rating</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>28</td> </tr> <tr> <td>2</td> <td>18</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>8</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Rating	Count	1	28	2	18	3	15	4	8	5	2
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<p>C4: Promote public debate and understanding about clinical and ethical conditions for appropriate home health care.</p>	 <table border="1"> <caption>Survey Results for C4</caption> <thead> <tr> <th>Rating</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>15</td> </tr> <tr> <td>2</td> <td>22</td> </tr> <tr> <td>3</td> <td>22</td> </tr> <tr> <td>4</td> <td>10</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Rating	Count	1	15	2	22	3	22	4	10	5	2
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<p>Topic D: Home Therapeutics & Assistive Technologies For Chronic Conditions</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>D1: Institutional care functions will continue to migrate from the institution.</p>	<table border="1"> <caption>Survey Results for D1</caption> <thead> <tr> <th>Response</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>45</td> </tr> <tr> <td>2</td> <td>15</td> </tr> <tr> <td>3</td> <td>5</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Response	Count	1	45	2	15	3	5	4	5	5	5
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<p>D2: Product design should be using a "consumer model" rather than a "medical model" to be able to take advantage of improvements in technology.</p>	<table border="1"> <caption>Survey Results for D2</caption> <thead> <tr> <th>Response</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Response	Count	1	35	2	25	3	10	4	5	5	5
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<p>D3: There will be an increase in chronic disease/disability in all age groups, including children, and populations. Numbers of persons with chronic disabilities leaving institutions and going into productive life will increase.</p>	<table border="1"> <caption>Survey Results for D3</caption> <thead> <tr> <th>Response</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>15</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Response	Count	1	35	2	15	3	10	4	5	5	5
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<p>D4: There should be a systems integration across health care and activities of life. No one has responsibility for the integration of the system.</p>	<table border="1"> <caption>Survey Results for D4</caption> <thead> <tr> <th>Response</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Response	Count	1	30	2	25	3	10	4	5	5	5
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<p>D5: Products not designated/intended for patient care will be important in Home Care.</p>	<table border="1"> <caption>Survey Results for D5</caption> <thead> <tr> <th>Response</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>5</td> </tr> </tbody> </table>	Response	Count	1	30	2	20	3	15	4	5	5	5
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<p>D6: The education of health care providers in Home Care Technologies needs to be expanded, and extended to include family members.</p>	<table border="1"> <caption>Survey Results for D6</caption> <thead> <tr> <th>Category</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Count	1	35	2	20	3	10	4	5	5	2
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<p>D7: Communications bandwidth is increasing as costs decrease. This will enable information exchange and encourage small suppliers to enter the market.</p>	<table border="1"> <caption>Survey Results for D7</caption> <thead> <tr> <th>Category</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Count	1	35	2	25	3	10	4	5	5	2
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<p>Topic E: Human Factors and User-Driven Design</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>E1: Development of wearable computer systems</p>	<table border="1"> <caption>Survey Results for E1</caption> <thead> <tr> <th>Category</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Count	1	35	2	20	3	10	4	5	5	2
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<p>E2: Development of hands-free controllers (I/O devices/interfaces)</p>	<table border="1"> <caption>Survey Results for E2</caption> <thead> <tr> <th>Category</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Count	1	35	2	20	3	10	4	5	5	2
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<p>E3: Emphasis on, or requirement of, human factors engineering, will be reactive rather than proactive</p>	<table border="1"> <caption>Survey Results for E3</caption> <thead> <tr> <th>Category</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Count	1	35	2	20	3	10	4	5	5	2
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<p>E4: Development of human factors databases, metrics, and standards for use in design, and with which to assess the adequacy of design</p>	<table border="1"> <caption>Data for E4 Bar Chart</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>30</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Value	1	25	2	30	3	10	4	5	5	2
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<p>E5: A structure for coordinating and regulating human factors engineering in home health will not develop spontaneously</p>	<table border="1"> <caption>Data for E5 Bar Chart</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Value	1	25	2	25	3	15	4	5	5	2
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<p>E6: Encourage the development and application of human factors techniques in the context of health care technology</p>	<table border="1"> <caption>Data for E6 Bar Chart</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Value	1	25	2	20	3	15	4	5	5	2
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<p>E7: Shift the focus from a traditional medical model to a market model, so the patient is viewed as a customer who has the ability to make choices about what to use.</p>	<table border="1"> <caption>Data for E7 Bar Chart</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>10</td> </tr> <tr> <td>3</td> <td>20</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Category	Value	1	30	2	10	3	20	4	5	5	2
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<p>Topic F: Smart Health Devices and Home of the Future</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>F1: We desire that health care will migrate to a proactive, preventative model rather than the reactive, episodic model utilized today.</p> <ul style="list-style-type: none"> • Intelligent wearable sensors • Trend-data-analysis tools, predictive algorithms • HMO's will drive migration to HCT's 	<table border="1"> <caption>Survey Results for F1</caption> <thead> <tr> <th>Response Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>45</td> </tr> <tr> <td>2</td> <td>15</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response Category	Percentage	1	45	2	15	3	10	4	5	5	2
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<p>F2: We anticipate that a variety of market-directed health care and information technologies will permeate the home environment:</p> <ul style="list-style-type: none"> • HC systems designed to meet special needs • Sensors & actuators on person and in their environment, with collective intelligence • Close exchange between devices and EPR's 	<table border="1"> <caption>Survey Results for F2</caption> <thead> <tr> <th>Response Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response Category	Percentage	1	35	2	20	3	10	4	5	5	2
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<p>F3: Universal design and standardization will facilitate flexible configuration of home technologies for special needs.</p>	<table border="1"> <caption>Survey Results for F3</caption> <thead> <tr> <th>Response Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response Category	Percentage	1	30	2	20	3	15	4	5	5	2
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<p>F4: We desire that individuals assume a more active role in their own health care in order for a proactive, preventative care model to be effective.</p> <ul style="list-style-type: none"> • Simple/low-risk care decisions by automated devices • Health maintenance via intelligent algorithms/agents • Individuals will control access to their medical info. 	<table border="1"> <caption>Survey Results for F4</caption> <thead> <tr> <th>Response Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>20</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response Category	Percentage	1	30	2	20	3	15	4	5	5	2
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<p>Topic G: Therapeutic Applications</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>G1: Technology will facilitate continuum of care and management into the home and community</p>	<table border="1"> <caption>Survey Results for G1</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>45</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response	Percentage	1	45	2	25	3	10	4	5	5	2
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<p>G2: In home smart devices and enabling technologies will automatically acquire, analyze and report back to the user as well as to other individuals or devices.</p>	<table border="1"> <caption>Survey Results for G2</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>35</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response	Percentage	1	25	2	35	3	15	4	5	5	2
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<p>G3: Information production and access is a bi-directional process.</p>	<table border="1"> <caption>Survey Results for G3</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> </tr> <tr> <td>2</td> <td>35</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response	Percentage	1	25	2	35	3	15	4	5	5	2
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<p>Topic H: International Issues in Health and Rehabilitation</p>	<p>agree ... disagree 1 - 2 - 3 - 4 - 5</p>												
<p>H1: ... a world in which appropriate and affordable telecommunication will be increasingly available globally (data, voice, video, translation,) along with cost reduction, wireless technologies and solar power generation.</p>	<table border="1"> <caption>Survey Results for H1</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>35</td> </tr> <tr> <td>2</td> <td>30</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response	Percentage	1	35	2	30	3	10	4	5	5	2
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<p>H2: ... a world in which networking via the WWN and internet will allow for the formation of health working groups not bounded by geography or nationality, resulting in increasing capability of software laboratories</p>	<table border="1"> <caption>Survey Results for H2</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30</td> </tr> <tr> <td>2</td> <td>25</td> </tr> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>4</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	Response	Percentage	1	30	2	25	3	15	4	5	5	2
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<p>H3: ... a world in which industry is committed to universal design with the broadest range of ability and function</p>	<table border="1"> <caption>Data for H3</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1</td><td>35</td></tr> <tr><td>2</td><td>15</td></tr> <tr><td>3</td><td>20</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>2</td></tr> <tr><td>6</td><td>1</td></tr> </tbody> </table>	Category	Value	1	35	2	15	3	20	4	5	5	2	6	1
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<p>H4: ... a world in which we are able to effectively share information about deployment of home health care services for a variety of populations. To the extent feasible, we should be able to share in the development of Home Health Care (HHC) technology across Nations</p>	<table border="1"> <caption>Data for H4</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1</td><td>25</td></tr> <tr><td>2</td><td>25</td></tr> <tr><td>3</td><td>20</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>2</td></tr> <tr><td>6</td><td>1</td></tr> </tbody> </table>	Category	Value	1	25	2	25	3	20	4	5	5	2	6	1
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<p>H5: ... a world in which federal and private support for collaborative efforts in both American and World-Wide will address global health problems</p>	<table border="1"> <caption>Data for H5</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1</td><td>20</td></tr> <tr><td>2</td><td>25</td></tr> <tr><td>3</td><td>20</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>2</td></tr> <tr><td>6</td><td>1</td></tr> </tbody> </table>	Category	Value	1	20	2	25	3	20	4	5	5	2	6	1
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<p>H6: ... a world in which increasing efforts and resources will be dedicated to the engineering and design of products and services which are appropriate to the cultures, economies, climates and geographies of low-income and under-served populations</p>	<table border="1"> <caption>Data for H6</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1</td><td>20</td></tr> <tr><td>2</td><td>25</td></tr> <tr><td>3</td><td>15</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>2</td></tr> <tr><td>6</td><td>1</td></tr> </tbody> </table>	Category	Value	1	20	2	25	3	15	4	5	5	2	6	1
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<p>H7: ... a world of unlimited access, a world which promotes compatibility, interoperability and reliability</p>	<table border="1"> <caption>Data for H7</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1</td><td>15</td></tr> <tr><td>2</td><td>30</td></tr> <tr><td>3</td><td>15</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>2</td></tr> <tr><td>6</td><td>1</td></tr> </tbody> </table>	Category	Value	1	15	2	30	3	15	4	5	5	2	6	1
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A.3: Individual Comments by Participants

During the Workshop, participants were encouraged to submit individual comments, up to 200 words, for inclusion within the Appendix. There were two motivations for this plan: to enable a participant to put forward a minority opinion that didn't find its way into the various statements or summary reports, and/or to allow a participant to affirm a specific concept or statement. Participants had about 2 weeks after the Workshop to submit such comments.

The following comments were received:

- [Tom Armstrong](#), Ph.D.
- [Keith Bauer](#), M.A., M.S.W.
- [Steve Bauer](#), Ph.D.
- [Mary Cupo](#)
- [Alexandra Enders](#), OT
- [Jim Hutchinson](#), M.D.
- [Brian Kon](#)
- [Joanne Kumekawa](#), M.B.A.
- [Gerald Loeb](#), M.D.
- [Gerald Miller](#), Ph.D.

Comments by **Tom Armstrong**, University of Michigan

One of the problems in discussing the Human Factors of HCTs is the lack of information about the equipment and procedures or a description of "human-machine system." The design of home care equipment is similar to aircraft design. Both are complex systems that exist in a broad range of environments; expert assistance is available only by remote means; and failure to follow proper procedures or respond correctly to a system irregularity or failure has a high risk of resulting in injury or death. The tasks required to operate aircraft have been identified and studied extensively, e.g., ground operations, departure, enroute, approach and emergencies. The result is a system that employs both automatic and manual equipment to achieve a balance between safety and cost.

A database of health care tasks is needed. This would provide information for identification of critical elements, optimal design of displays and controls, use of automation as necessary and determination of necessary training for operation in the home environment. Such a database should include descriptions of goals, equipment and human components, and interactions. The database should be maintained on a server so that it can be interrogated and updated as necessary.

Comments by **Keith A. Bauer, MSW, MA (ABD)** University of Tennessee, Knoxville

Topic C focused on the ethical, legal, and policy issues associated with the design and use of HCTs. There was a consensus among group members about our findings, but a disagreement on how to rank them. This disagreement, in part, was due to a conflation of ethical and legal categories. Privacy and confidentiality issues were often reduced to legal problems, whose solutions required only legislative ingenuity. But, a reductionist view of ethics--a view that makes ethics coterminous with the law--ignores the moral basis of the law. Laws may be ethical or unethical, but they are not identical with the ethical principles and moral values they express.

Furthermore, the transformation of ethical matters into legal matters reinforces a dominant trend that emphasizes the economic and technologic viability of HCTs. These are very important considerations, but the economic and technologic viability of HCTs does not equal an ethical justification of their use. That is, economic, technologic, and legal "can" does not imply a moral "ought". With that said, however, I do believe that the HCT Workshop has identified key ethical and social issues associated with the design and implementation of HCTs, and this will facilitate future research and policy development in this area.

Comments by **Steve Bauer**, University of Buffalo

Human Factors (Topic E):

- Continuous monitoring of health parameters will provide an extraordinarily rich data set which could drive the development of new paradigms for such things as drug response, time course and effectiveness, early detection of symptom onset.
- Human system modeling will be critical for the integration and interpretation of health parameters. Modeling will need to take place in conjunction with data reduction, analysis, AI techniques, ...

HC Devices (Topic D):

- Home health care (and related) products should penetrate niches in the private sector more easily than in the public sector. Reasons: free market can set product reimbursement rate, targeting of affluent niches, market penetration with less regulated products (e.g. athletic related monitors)
- Related to this, technology with a dual purpose (e.g. Home Health and Home Exercise monitoring) is likely to evolve faster than technology just targeting Home Health.
- Persons other than medical professionals need conditional access to the home health care system. An argument could be made for nurses, physical therapists, speech therapists, exercise therapists, ... and many others. Limiting access just to medical doctors greatly reduces the potential health impact of the system.

Comments by **Mary Cupo**, VA R&D, Baltimore

I felt the HCT workshop provided a very effective forum that facilitated and encouraged multidisciplinary interaction. This served as a good catalyst to initiate interactive discussion among our groups and helped to achieve the desired outcomes of the workshop. Considering the time constraints, all participants provided insightful responses and recommendations for the eight topic areas. The overriding theme appeared to be the trend of continuum of care for the patient, making it a seamless transition from institution to home. As evidenced by the presentations, there is a myriad of issues involved in seeing this vision through to fruition. Issues from federal funding & legislation to development of appropriate data acquisition systems to retooling clinicians & fostering interdisciplinary communication. But the key element is ultimately the patient/consumer. They will be thrust into an environment where they will be the decision-makers when it comes to their health care. Consumers will need to be educated as to the benefits of this new technology as well as being involved in the design of the equipment to meet their needs. This workshop was a great beginning to spearhead the effort of

alerting the appropriate agencies of where we are now; what will be coming in the very near and long future in terms of technology.

Comments by **Alexandra Enders, O.T.R.**, University of Montana

Consumer and market driven markets were identified as a powerful force in developing home care technologies in the future. However, there was virtually no **representation from manufacturers and commercial sector companies** who will be developing and delivering emerging technologies. It is essential that industry have a chance to participate proactively in the process. Industry should be involved in all aspects, including working hand in hand with customers to identify and enhance market incentives, and to reduce disincentives.

Further, the products and systems involved must be able to be deployed globally, if the promise of “geography-free” wellness is to be realized. Compatibility, standards, and international harmonization must be addressed in order to reduce international trade barriers, and to facilitate overall market numbers and global penetration. Regulatory efficiency must be planned in this era of technology convergence (telecommunication, information technology, entertainment). There must be a balance between protecting public safety and access, and reducing disincentives to manufacturers for incorporating features in regular consumer products which could also be used in home care applications (e.g. manufacturers are likely to be reluctant to built in features that even if inexpensive, would require both FCC and FDA approval).

As the very nature of a “medical device” is being redefined, questions about who has regulatory authority and what can and should be regulated have emerged. Without the active participation of manufacturers and commercial sector companies, the promise of a vibrant consumer and marketplace will remain little more than a dream; we will be stuck with “business as usual” and medically top-down decisions driven by a handful of third party payers.

With some whimsy, I think it important to note, that all of the workshop participants are potential consumers of the technology of home care as we defined it. However, **very few of us took off our professional hats, and spoke as consumers**, about what we wanted our support systems to look like in the future. I wonder if there would have been any differences in the rankings, if each of us were given the opportunity to identify priorities as if our own futures depended on it! They do.

Comments by **J.R.B. (Jim) Hutchinson, M.D.**, St. Joseph's Hospital, Atlanta

The challenge: How to deliver quality health care to more people at less cost.

The need: Pilot projects that show efficacy/improved care and efficiency in costs to educate providers (professional/family) and patients in how the technology enriches, empowers, eases, and protects their mission.

The barriers: money/attitudes. Education gained from the above projects gradually changes attitudes. Funding/Publicity of the pilot projects by industry/foundations/government and legislated tax advantages should replace the traditional expectations of reimbursement. As public benefits become known, pressures rise to produce competitive telecom rates, affordable technology and enhancing legislation to meet the above challenge while reducing unit costs for care provided.

Comments by **Brian D. Kon**, AZtech, Inc., Buffalo, on population trends

The future of home health care is uncertain. Looking ten years into the future it may be difficult to judge where resources should be allocated. However, what is certain is that the demographics facing the healthcare system will change and will require attitudes and expectations to change with them.

In the two decades following World War II the number of babies born was at the highest level in the history of the United States. This cohort referred to as "baby boomers" has driven the marketplace since that time and will continue to do so into the foreseeable future. And now that the baby boomers are hitting middle age and becoming part of the 50+ population they will have a significant impact on the healthcare and home care markets.

During the next 10-year period there will be a 17 per cent increase in the number of people over the age of 65, reaching 39.4 million people in the United States. In the 20 years following, there will be a further increase of 75 per cent, increasing the numbers further to 69 million people over the age of 65.

Mortality rates are steadily decreasing in developed countries due to the improved medical and rehabilitative technologies. Therefore, many people who would have died in previous years from life threatening conditions such as stroke, heart attack or spinal cord injuries will not only survive the initial insult, they will live on for many years thanks to these technical advancements.

Along with increased life expectancy, there will be an increase in age related disabilities as the population swings from its youth orientation to that of the elderly. Common age related disabling conditions include arthritis (37 million people in the US), hip fractures (200,000 annually), stroke (third leading cause of death in the US), diabetes Mellitus (6.7 million Americans) and so on.

So what does all this mean to the healthcare system in the United States? First of all, further advances in medical technology will help us live even longer than what is currently expected. It is already anticipated that children born in the last decade of the 20th century will live throughout the 21st and will likely be a part of the 22nd century. Along with the increase in age will come increases in disabilities and the need for devices to assist with the *coping mechanism*, and towards self-care and independent living. Second, the cost of in-hospital care is increasing and many existing programs may not survive the current trend of cost cutting measures within the government and institutional care facilities. This means the trend to rehabilitate at home will further increase. It will also mean that more people will be caring for themselves and at the same time they will also be caring for other family members in the home environment. In order for the healthcare system to cope with this trend there must be the services and technology made available to assist in the care and monitoring of persons at home.

Advances in technology are key to the survival of the healthcare and home care industries. In order to be successful we need to look to the future and determine what the face of the population will look like. The development of technologies and the application of resources must be directed towards the reality of healthcare and the population that it will be serving.

Comments by **Joanne Kumekawa**, M.B.A., Office for the Advancement of Telehealth

The telecom infrastructure questions that were raised at the conference re: barriers to deployment of telemedicine in developing countries have been addressed before by the telecommunications sector.

The International Telecommunications Union (ITU), in Geneva Switzerland, will be having its second Telemedicine conference in Brazil this year. (I used to work the strategic planning unit of this UN special agency.) While they may not know a lot about health care, they have been looking at developing countries infrastructure issues for a long time.

Why recreate the wheel? These questions are being addressed in several fora including the ITU, Commerce, and the WTO. I believe that the WTO will be looking at Health Services as one of their trade issues.

Comments from **Gerald E. Loeb, M.D.**, Queen's University, Canada

The philosophy and evolution of consumer-driven telehealthcare is almost the opposite of institutional telemedicine. For better and for worse, telehealthcare is riding the same futuristic and libertarian wave as alternative medicine, pornography and the internet as a whole. This wave is already washing away many of the consumer protections that we came to expect from government during the past century.

FDA Premarket Approval of telehealthcare will be relegated to the status of a Good Housekeeping Seal of Approval. It will be relied upon by cautious consumers and prudent practitioners and required by third party payers, but government will be powerless to prevent individual consumers from spending their own money to purchase goods and services that range from innovative to fraudulent to hazardous. The main restraint on large suppliers will be the threat of private litigation. In the balkanized world of the internet, neither litigation nor regulation will have much effect on small start-up suppliers (who may be based in other countries), freeing them to innovate in some cases and to defraud in others.

It will be extremely difficult to measure the real costs and benefits of this emergent development of telehealthcare. Nevertheless, government must resist the temptation to make policy and regulations based on the more publicized and politicized anecdotes. To do so is to risk inappropriate policies that stifle development and unenforceable regulations that squander credibility.

Government should expand its role as tester and educator. "FDA" is still a "brand" that consumers associate with authoritative if not authoritarian positions. The FDA may not be able to prevent consumers from receiving misleading information through telehealthcare, but it is well-positioned to send a prominent and credible voice of reason to those who will listen.

Comments by **Gerald Miller, Ph.D.**, Virginia Commonwealth University

One aspect of using a breadth of backgrounds for each topic was that the participants often relied on lay thinking regarding technologies. This was quite apparent in those technologies that many participants felt were already commercially available, such as voice recognition systems. Although they acknowledged that there might be problems associated with the use of voice technology for the disabled or the elderly in a home or remote environment, they believed that such problems could be easily overcome and would, in fact, be solved within the coming five years.

Participants felt that any technology which would be readily available within the coming five years was not worthy of significant mention in the final report. My belief is that the National Science Foundation should address the fundamental issues related to technologies that might be useful in the home within the next five years. Voice recognition technology is a prime example of one that will require a better understanding of the recognition technologies and their limitations in order to develop a more useful medium for the home environment. In addition, the FDA might benefit from a better understanding of the engineering and design aspects of such a technology.