Ways of Knowing, Learning, and Developing

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The information age presents great opportunity to move from data to information to knowledge and potentially to go further to generate understanding and wisdom. As information is generated in ever smaller segments, however, and as we use information for increasingly narrow purposes, our understanding of the world is becoming more and more fragmented.[1]* Stunted development along this data-information-knowledge-understanding-wisdom pathway[6] leaves the potential of the information age unmet and its inhabitants often overwhelmed and unwise.

DIFFERENT WAYS OF KNOWING AND DEVELOPMENT

There are different types of knowledge and different ways of knowing. Schumacher[7] and then Wilber[8] articulated a systematic way to bring together different perspectives that collectively reveal a rounded view. As shown in Figure 1, these ways of knowing have 2 dimensions: inner/outer and individual/collective.

Figure 1. Different ways of knowing.

	Inner	Outer
Individual	I	It
Collective	We	Its

Adapted from Schumacher[7] and Wilber.[8]

Inner knowledge is personal and subjective. It is based on lived experience. Within inner knowledge are 2 perspectives. Inner/individual knowledge is based on personal experience—"I" knowledge. Inner/collective, or "We" knowledge, is based on shared experience. Research on inner knowledge can involve experiments and quantitative survey measures, but inner knowledge often is generated by qualitative methods, the strength of which is putting investigative data into context. Inner knowledge also is developed by personal or interpersonal observation, reflection, and contemplation.

Outer knowledge typically is thought of as objective—it is visible from the outside. Outer/individual knowledge is based on how specific entities in the natural world operate—"It" knowledge. Outer/collective, or "Its" knowledge, is based on how interrelated natural systems work. Research on outer knowledge typically involves what can be observed and quantified. Outer knowledge often is generated from a reductionist perspective that partitions the phenomena under study into parts.[1] Outer knowledge also is amenable to more expansive and integrated approaches that recognize the interrelatedness of the physical world.[3-5,9-31]

Within each way of knowing, it is possible to evolve along the spectrum from data to information to knowledge. Even when the focus is on only one way of knowing, the other ways of knowing are still present, even if we do not pay attention to them.

For example, when we do research to develop new drugs or when we apply this pharmacotherapy ("It") knowledge to treating people with diabetes, other ways of knowing are still important. These other ways of knowing might include the following:

• Systems ("Its") knowledge on how this drug affects other body systems or how systems of care affect delivery and adherence to treatment

• Interpersonal ("We") knowledge on how diabetic treatment affects families, or on how care teams work together to facilitate or impede diabetes self-management

• Personal ("I") knowledge about what it means to experience living with the illness of diabetes (as opposed to the ("It") knowledge of the disease[32] of diabetes

Even when a particular study does not address all these domains, the generation of useful knowledge and understanding is enhanced when researchers periodically raise their gaze to consider the other ways of knowing the phenomena under study. And a full line of investigation[33] needs to consider all 4 ways of knowing[34] either simultaneously or sequentially.[35]

Much of the problem of translating research into practice[36,37] comes from focusing only on a single way of knowing and ignoring other ways that are important

for the application of knowledge. Much of the lack of progression from knowledge to understanding and from understanding to wisdom comes from not paying attention to complementary ways of knowing.

Development is possible both within and across each way of knowing. Data can be processed into information that answers who, what, where, and when questions.[38] With application and sensemaking,[39,40] information becomes knowledge that answers how questions. Continued synthesis of knowledge and learning can generate understanding that sheds light on why.[38] Further discernment, judgment, and openness that put understanding into a larger context foster the possibility of wisdom. Development along the higher levels of this continuum is facilitated when different ways of knowing are considered together.

As Kolb pointed out in his famous "learning cycle,"[41,42] knowledge does not translate into understanding in a simple or direct way. For individuals and groups alike,[43,44] cycles of inquiry and action are needed in which theory and practice are connected by reflection and experimentation. Similarly, research does not simply translate into development, nor do data translate into learning. People have to be persuaded of the relevance of data to their own context. In obvious or subtle ways, for one person's ideas to become another person's learning, the recipients need to make the ideas their own. A crucial part of owning the ideas of another is to gain a rounded view. Wisdom comes from being able to see an issue from multiple perspectives and discerning ways in which they make sense as a whole.

The resources of the information age create the possibility for unprecedented communication between different ways of knowing. In practice, however, narrow interest groups and experts working only in their areas of expertise have created fragmented knowledge, limited understanding, and a paucity of wisdom. Work is needed to generate opportunities to pursue shared understanding and to create space for the emergence of wisdom.

DIFFERENT WAYS OF KNOWING IN HEALTH AND HEALTH CARE

In 2001, Will Miller, Ian McWhinney, and I examined the implications of Wilber's 4 ways of knowing for developing generalist knowledge.[34] We focused our consideration of inner/individual, or "I," knowledge on the perspective of the clinician/researcher, and described the fruitful borders between individual

Figure 2. Different ways of knowing about health and health care.

	Inner	Outer
Individual	Clinician, Patient, Health Care Worker, Researcher, Policy Maker	Biology, Disease, Treatment
Collective	Family, Health Care Team, Network, Community	Systems, Organization, Ecology

Adapted from Stange et al.[34]

knowledge, patient/family/community knowledge, health services research knowledge, and biomedical knowledge.

Figure 2 expands on this analysis to consider different ways of knowing about health and health care. Each of the perspectives shown in Figure 2 is relevant to furthering understanding about health. Most research focuses on the outer/individual quadrant—the domain of basic biomedical and most clinical research—biology, disease, and treatment. Yet, the same health-related phenomena simultaneously have other aspects worthy of research and understanding:

• Outer/collective systems knowledge in how the health of individuals relates to the ecology of humans living together on earth, or how health care is organized

• Inner/collective aspects that relate to the family or community experience of health, illness, or the team experience of generating new knowledge or providing health care

• Inner/individual aspects that relate to the personal experience of illness, health, the provision or receipt of health care, or conducting research on these topics

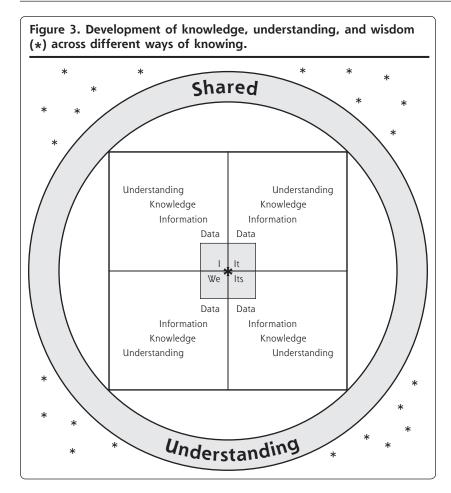## KNOWING AND DEVELOPMENT IN HEALTH AND HEALTH CARE

Figure 3 depicts that each way of knowing has the potential to evolve from data to information to knowledge to understanding. Higher levels of understanding can occur when different ways of knowing are considered together. This cross-sector synthetic understanding has the potential to lead to wisdom based on shared understanding, and to tie in to the wisdom that is at the center of all ways of knowing.

How Does This Work?

Let's consider the story of Sophia, a woman with diabetes.

Sophia notices that on some days she feels great, while on others she feels terrible. She keeps a diary to assess what aspects of her life could be making the difference. Sophia quickly realizes that her sense of disease or well-being is related to certain ways of eating and activity. This "I" information becomes knowledge

Figure 3. Development of knowledge, understanding, and wisdom (∗) across different ways of knowing.

house. She also does better when her health care team (and her family) encourages her incremental steps rather than nagging about setbacks. As Sophia, her family, and her health care team communicate with each other, they come to a shared understanding of how Sophia can feel better, develop richer relationships, and control her diabetes without medication.

Sophia and her family, community, and health care team engage in a participatory research program to systematically enhance this understanding across many people similar to Sophia. After many slips and restarts and learning to value diverse perspectives and ways of knowing, new knowledge is generated on how diabetes can be managed and prevented by the conjoint action of individuals and health care workers, with participation by families, communities and health care teams. New perspectives develop that are not just about managing diabetes but also about enabling individuals

when Sophia experiments and reflects. After years of binge eating and crash dieting, Sophia finds that she feels better when she follows a simpler practice of eating more vegetables and fewer sweets. She tells her doctor that she is now living a "healthy lifestyle."

In her medical record notes, Sophia's doctor writes: "Following a diabetic diet and exercise self-management." Her doctor also reflects on how much more satisfying it is for her to help facilitate the kind of changes Sophia is making than it is to just prescribe more medication. Her doctor considers how she and her practice-based research network and its community partners might work together to examine how patients like Sophia manage to buck the trend of rising weight and escalating medication use.

Sophia and her physician are generating and applying knowledge from different perspectives, but each develops a complementary understanding in their "I" domain.

Related experiences in the "We" domain occur. Sophia finds that she is more likely to eat well and be active when her family bikes with her and when they have only vegetable and fruit snacks available in the

and community members to do valued activities and develop meaningful relationships.

Meanwhile, corresponding activity is happening in the "Its" domain. Sophia and her family move to a planned community with walking paths, community gardens, public transportation, a multigenerational school, and diverse employment. Here they find it is even easier to maintain a healthy lifestyle. They realize that the social structure and environment have as much or more to do with health than does their health care. Sophia's health care team now finds that its role involves not just the care of individual patients, but also linking community organizations and advocacy groups to enhance the built environment and to promote health. They develop computerized "Its" reminder systems and develop a new community and patient steering committee. The practice works with other practices in its network and with community voluntary organizations so that when they identify patients at moments of motivation for behavior change, systems are in place to facilitate referral to community-based programs. Strong "We" relationships developed over time support this work.

Behind the scenes, others are generating different systems knowledge. Biological researchers living and working in this community begin to explore the relationships among cellular stress signaling and dysfunction that appear to affect not only the development of diabetes, but also aging and the myriad disease processes associated with aging. Sociologists in the community take a complementary tack of studying healthy aging. Both these groups of scientists find eager participants when they decide to combine their biomedical and sociocultural investigations, sharing emergent findings and developing new questions together with participants, the health care community, and local government and nongovernmental organizations.

The "Its" way of knowing described above is paralleled by an "It" way of knowing the same phenomena. Working back from data on a particular metabolic pathway, the researchers find a protein and its related genetic polymorphism that seem to be associated with cardiovascular complications from diabetes. They envision personalized medicine that will use knowledge of an individual's genetic makeup to allow physicians to give the right drug at the right dose to the right patient to prevent diabetic complications.

Each way of knowing in this scenario involves understanding.

• The "It" knowledge involves a genetic-protein-metabolic pathway and its implications for drug treatment and behavior change.

• The "Its" knowledge involves the relationship of this pathway to diseases other than diabetes and the effects of the organization of health care and environments—in other words, how health care, social, and environmental systems can affect both disease and health.

• The "We" knowledge relates to the interpersonal experience of illness or health—being part of a family, team, or community.

• The "I" knowledge involves the personal experience of illness and health. It also can involve the experience of working to treat illness, improve health, or generate new knowledge needed for these roles. This "I" knowledge relates to being a person in roles and relationships that may be as a family member, health care worker, researcher, citizen, or all of these together.

Together, these different ways of knowing lead to a much more nuanced and integrated vision of personalized medicine.[1,4] This vision involves knowing the particulars of the person ("I" knowledge), their perceived family, community, and health care team context ("We" knowledge), their observed health care system and socioenvironmental context ("Its" knowledge), and their biological makeup and pharmacotherapeutic options ("It" knowledge).[2]

Across these 4 domains of knowing, the possibility of shared understanding exists and can be developed.[34] Beyond cross-cutting understanding, wisdom can emerge—wisdom to guide individual knowing, understanding, and action toward shared common good; wisdom to be open to possibilities not yet envisioned.

Imagine the symbiosis, synthesis, and synergy that could be created if personalized medicine were understood not just from the perspective of biomedicine, but also from systems and ecological, community and family, and person perspectives.[4,45,46] Imagine the wisdom that could emerge if one way of knowing was not privileged above the others, but if all ways of knowledge were valued and reflected upon simultaneously. And imagine if, rather than focusing our information systems to support only care of and billing for specific diseases, we created systems to foster development: up the data-information-knowledge-understanding-wisdom cascade and across different ways of knowing. Imagine if our medical records became health records that brought together person, family/community, systems/environmental, and biomedical information to generate understanding of how these different ways of knowing can come together to guide resource use that is wise for the individual and for the population.[47] Imagine if we trained patients, healers, and researchers to work together to use these different perspectives to foster health and enable healing[48-51] rather than to deliver commodities of health care.[1,2,4,28,31,52-59] Imagine if the role distinctions became blurred between the target and the user and the generator of new knowledge.[60-69]

IMPLICATIONS FOR KNOWLEDGE GENERATION AND APPLICATION

If we take seriously the notion of complementary development in different ways of knowing, our way of generating and applying new knowledge will be forever changed. Even when we are working in a single domain, we will understand that other ways of knowing are operating. We will every now and then shift our gaze to these other ways, informing our narrower work and putting it into a context that has the potential to generate meaning.[2] We will recognize and begin to act on the commonalities across different ways of knowing. We will develop greater understanding and be open to greater wisdom.

In the "I" domain—the personal—we will organize our curiosity: perhaps journaling; certainly making time for reflection as well as for action; iterating between generating and applying knowledge; increasing our openness to understanding and wisdom.

In the "We" domain—the shared—we will work to develop shared common experience and values.

We will develop teams that sometimes progress from multidisciplinary to interdisciplinary to transdisciplinary.[28,31,53,55,70-74] The multidisciplinary team is like the parallel play of 2 year-olds, each doing his own thing, working in his own field. Members of the interdisciplinary team work on a common project but stay within the perspective of their own discipline. The transdisciplinary team invests in relationships, works through the struggles of finding common ground, and begins to develop a shared language for understanding a problem and possibilities.[52,75] The Clinical and Translational Science Awards from the (US) National Institutes of Health are intended to foster this kind of development toward communities of research, development, and application. It will take courage and development in all 4 domains to make the needed changes from current reductionistic, silo approaches.

In the "It" and "Its" domains, we will focus more on health and less on disease. We will recognize and act on the interconnectedness of systems, be they microscopic or ecologic. We will use multiple, complementary theories of knowledge.[76] We will develop research tools which include quantitative methods that reduce and isolate, and qualitative methods that focus on meaning and context. We will develop participatory[62,64,68,77] and whole-system[78,79] approaches to generating and applying new knowledge. We will organize our practices and our health care systems to gather data across all ways of knowing, to process these data into information that is relevant to personal and community health, not just to the provision of health care. We will develop knowledge which keeps the 4 ways of knowing together so the understanding we develop is more likely to be shared understanding that leads to wisdom, rather than isolated understanding that optimizes the parts of people but risks denigrating the whole.[1,80]

INTEGRATION

Cleft

By Jon Neher[81]*

As Caroline was born

the doctor saw

the split

from lip to nose—

purple rimmed,

going down deep—

Deep enough

to hurt

generations.

And the imperfect doctor,

tired of wounds

tired of divisions,

saw the small

wholeness

Chose that moment

Chose tenderness

saying simply,

She is beautiful.

And the imperfect mother,

tired of pain,

held her child,

touched the tiny,

ragged face

Chose that moment

Chose acceptance

crying softly,

She is beautiful.

Caroline is known by her mother. She is known by her doctor. In some way we do not fully understand, she is known by herself and beyond herself.

Caroline is known by her family and her community, by her doctor and his practice.

Caroline is known as an insured beneficiary.

Caroline is known as a cleft palate.

Caroline is understood as a person with challenges and with potential that include but transcend her biology, her health care system, her community, and herself.

Caroline's full potential is beyond the reach of our intellect.

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