

## Minnesota Model

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It should come as no surprise that in a state where, as the resident bard—Garrison Keillor, has proclaimed “all the women are strong, all the men good looking and all the children above average” that cooperation among the state’s leading biomedical facilities has been institutionalized to facilitate the sharing of individual strengths for the collective good of finding biomedical “answers to life’s persistent questions.” While it might be mistakenly thought that this cooperation is born of the strength of the Keillor delineated traits, it actually rests on a long-standing model of business and civic partnership, now known as the “Minnesota Model,” that placed a primacy on nonpartisan, collective efforts to solve the larger problems of community life and infrastructure with intellectual cooperation, donated intellectual labor, and corporate philanthropic dollars, often pegged to 5% of a corporation pretax earnings.

The evolving Minnesota Model of biomedical clinical and basic research cooperation reaches back over 20 years, when groups of subspecialty clinicians from the Mayo Clinic, the University of Minnesota, and the Minneapolis Heart Institute began to meet several times a year to discuss cases and interesting developments in their respective fields. The meetings were often held on “neutral ground,” frequently at the historic St. James Hotel in Red Wing, conveniently located half way between Minneapolis and Rochester. Thus was laid the foundation for the more recent cooperative efforts spawned by the notion that, in collective strength rest, the resources to merge clinical and basic research into translational programs to take quick advantage of opportunities to clinically “operationalize” new discov-

eries as well as providing for well-integrated studies to define in a longitudinal fashion the proteomic, genomic, molecular biologic, and clinical history of various cardiovascular diseases and cardiovascular risk states.

This two-pronged approach, rapid testing of new ideas and technologies as well as further, multidisciplinary and modality definition of the natural history of disease states and their response to therapy, is being designed to take advantage of the deep reservoir of expertise resident in Minnesota in the areas of basic research, public health and cardiovascular epidemiology, clinical care delivery, biomedical product commercialization, biomedical engineering, and venture capital. Additionally, Minnesota’s increasingly variegated population allows study and intervention in a broad variety of ethnic and gender population groups.

The first prong of this approach, a variation on the “rapid prototyping” model now being increasingly used in industry, draws upon the highly aborized, clinical care networks of the sponsoring institutions. These extensive clinical care networks extend out into the greater five state, upper Midwest region such that hardly a town with a post office, a gas station, a bar, and a grocery does not have geographically proximate and temporally regular access to a cardiologist from one of the major, sponsoring institutions or their affiliates. Each of the sponsoring institutions and in turn the evolving collaborative structure is enmeshing these clinical care delivery sites into aligned research collaboratives that will allow for real world, efficient and rapid patient enrollment for both early proof of concept studies and the larger, more advanced studies necessary for governmental approval of new therapies. Furthermore, the efficient integration and refinement of these networks, allows for bidirectional disease management programs that recognize the chronic nature of cardiovascular disease and

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risk, improving patient care through enhanced integration of specialist and primary care as well as for the more rapid dissemination of new information and technologies to the patient's bedside, wherever that may be.

Despite the major advance in cardiovascular care, outcomes, and technology over the last three decades, our knowledge of the natural history and response to therapy of cardiovascular disease and risk in terms of the cell biology, genomics, and proteomics remains woefully under realized. While we developed systems of care to deliver acute, episodic treatments and evolved an entire generation of subspecialists to deal with each aspect of a single disease, our integration into a longitudinal, systems biology model has lagged behind. The Minnesota Model has harkened to the words of Claude Bernard to the effect that “chance favors the prepared mind.” If we are to truly eliminate, or more realistically, dramatically reduce, cardiovascular disease and its impact; then we need a well-conceived plan to recognize and take the cues provided by sequential sampling of the various cardiovascular diseases over time. If our current model that disease and risk states represent a dynamic equipoise between injury and repair, then the future economy of opportunities for intervention will come from an identification and understanding of the biologic signposts that equipoise has been disturbed and a temporal and biologic understanding of the dynamics of repair. Such an understanding could teach us how to identify risk more completely in individuals (personalized medicine) and enhance the effectiveness of our interventions by drawing

upon, modifying, and magnifying the cues available in the biologic microenvironment

Thus, the Minnesota Model places a premium on identifying epidemiologically sound populations of disease or at risk patients and identifying the biologic underpinnings of the presymptomatic, symptomatic, convalescent, and recovery phases of an illness—basic science annealed to the bedside. This will be accomplished by broad interdisciplinary groups of clinicians, epidemiologists, and basic scientists complemented by biomedical engineers and pharmaco development experts engaged in a carefully orchestrated, continuing series of dialogues and analysis to shorten the time from bedside to bench and back again.

To be sure there are numerous challenges, beyond the obvious biologic ones, to this Minnesota space shot on cardiovascular disease, legal structures will have to be created, intellectual property issues resolved, economies of scale created, and funding obtained. The governor of Minnesota has tossed down the gauntlet to the greater Minnesota biomedical community by offering up to \$200,000,000 over the next 10 years to fund such an effort. In addition to having strong women, good looking men, and above average children Minnesota also has another secret ingredient to make this work—“Minnesota Nice”—a tradition of pitching in to do what needs to be done, celebrating our collectiveness, and a strong tradition of laying down our differences in favor of cooperative solutions. It is likely that the St. James Hotel will be busy for a long time to come.