Review

TRANSLATION RESEARCH FOR IMPROVING DIABETES CARE: A PERSPECTIVE FOR INDIA

Michael M Engelgau, KM Venkat Narayan

By the end of the 20th century the worldwide diabetes pandemic had affected an estimated 151 million persons, distributed among both developed and developing countries.(1,2) India has more affected persons than any other country in the world. Unfortunately, the future looks even worse, with a 170% increase expected by 2025 in developing countries and a corresponding 42% rise predicted for the developed countries.

Diabetes accounts for an extraordinary amount of human suffering as it is a major cause of blindness, kidney failure, amputations, and cardiovascular disease, and its complications substantially reduce both quality and length of life (3-5). In addition, diabetes imposes staggering economic costs while lowering productivity and wasting social capital (6,7).

EFFICACIOUS TREATMENTS EXIST

Fortunately, several efficacious treatments are currently available to reduce or prevent diabetes related complications. Glycemic and blood pressure control can reduce micro vascular (retinopathy and nephropathy) complications (8,9); eye examinations with timely follow-up and photocoagulation can prevent vision loss (10); foot care can decrease serious foot disease and amputations (11); control of blood pressure and lipids as well as aspirin use can prevent cardiovascular disease (9,12,13); angiotension-converting enzyme (ACE) inhibitors can reduce nephropathy and cardiovascular disease (14,15); and influenza and pneumococcal vaccines can reduce hospitalizations, respiratory conditions, and death (16).

The current challenge is to effectively implement efficacious treatments across the population. Unfortunately, numerous barriers to implementation exist, at a variety of levels, from the patient up through the provider, health care system and society (17). One particular problem is that most health care systems have evolved out of caring for acute diseases, not chronic diseases like diabetes. Faced with treating other conditions requiring more urgent attention, it is not surprising that health care providers and systems often give diabetes and other chronic disease less attention than they merit. That persons with diabetes need comprehensive, ongoing care may be overlooked because of a lack of appreciation that the disease is serious, that early diabetes is relatively asymptomatic or that symptoms can go unrecognized, and that much of diabetes care relies on behaviors and selfmanagement. Additional challenges include the fact that management of a life long chronic disease needs patient empowerment as well as care systems that are flexible and adaptive to local needs.

CURRENT DELIVERY OF DIABETES CARE

In general, the quality of diabetes care remains suboptimal worldwide, regardless of a particular country's level of development, health care system, or population. The CODE-2 study, conducted in eight European countries has found suboptimal diabetes care in each, regardless of population size or type of health care system (18). In the United States of America, population-base surveys in the 1990s among adults (18-75 years old) found that only 29% of the population had an A1C test, 63% a dilated eye exam, and 55% a foot examination within the last year. The median A1C level was 7.5%, but 18% had poor glycemic control (A1C>9.5%) (19). Lipids were tested in 85% within the last two years, but only 42% had low density lipoprotein (LDL) concentration indicating good control (<3.4 mmol/L). Finally, only 66% had a blood pressure of <140/90 mmHg.

In Asia, the Diabcare-Asia project, conducted in the late 1990s was designed to provide large-scale, yet simple, standardized information about patient characteristics and care received from numerous centers across each participating country. Results from Singapore, India and Taiwan, using similar methods, have found that between one third and one half of the diabetic population had poor glycemic control and that lipid control is suboptimal (Table 1) (20-22). These findings were surprisingly similar to both the European and USA studies (18,19). Thus, regardless of the health care system, country, region, or population, the level of care for diabetes is

currently suboptimal and regions are much more similar in the deficit than they are different.

Table 1. Studies of the Quality of Diabetes Care in Selected Asian Countries*

Characteristics	Country		
	Singapore[20]	India[21]	Taiwan[22]
Total sites (n)	22	26	25
Total patents (n)	1697	2269	2446
Year of study	1998	1998	1998
Age (mean, yrs)	58	54	61
Duration of diabetes			
(mean, yrs)	10	10	10
Type 2 diabetes (%)	91	91	97
Level of care			
A1c			
Mean (%)	8.0	8.9	8.1
% Poor control **	32	50	35
Lipids (mmol/l)			
% Total cholesterol>5.2	67	46	43
% Triglycerides >1.7	48	54	47

See references 20 (Singapore), 21 (India), and 22 (Taiwan).In Singapore and Taiwan, diabetes clinics (study sites) were defined as medical facilities (primary care and restructured hospital diabetes clinic) that managed 100 or more diabetic patients per month. In India, diabetes centers (study sites) were both public and private sector from across the country with no specific criteria used to select centers.

** *>2% above the upper limit of normal range*

TRANSLATION RESEARCH

To improve the level of diabetes care, enough to achieve better outcomes, research efforts are needed to translate efficacious clinical and public health interventions into forms that can be delivered uniformly in typical clinical settings (23). This task is not trivial, however, because biological, social, educational, geographical (urban/rural), cultural and psychological influences on the patient, provider, health care system, and society, all need consideration. Any of these domains may present barriers or opportunities.

Translation research involves (i) assessing the level of care being delivered, (ii) determining the barriers to improving care and (iii) developing new strategies for delivering better care. The assessment uncovers deficiences and provides a benchmark against which future assessments. The second aspect of translation research is to determine the barriers to improving care. The barriers to providing routine preventive care, which includes eye and foot examinations, A_{1C} tests, urine testing for microalbumin and monitoring cardiovascular risk factors, need to be understood. These barriers may differ dramatically by region. Armed with knowledge about deficient areas and significant barriers, researcher and public health workers can test new and locally modified approaches and pursue those found suitable.

The relationship of translation research to public health surveillance, epidemiology, and clinical research is shown in the figure 1. Both surveillance and epidemiology help to characterize the problems being addressed; this information leads to the development of clinical trials, which lead to potential

Fig. 1 : Relationship between Translational Research to Clinical Application
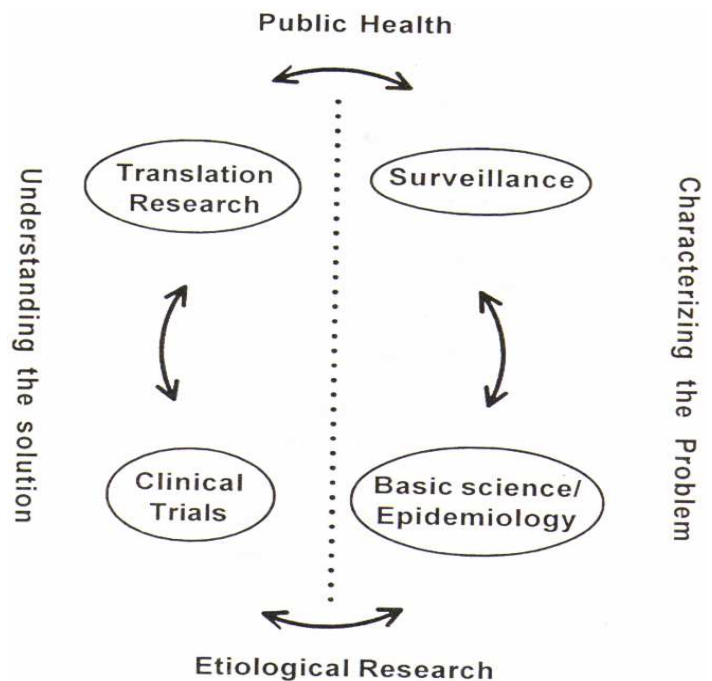
solutions to improve care. Clinical trials, however, are usually developed with an emphasis on highly rigorous methods, and they aim for internal consistency and essentially to discover what can be accomplished under ideal circumstances. Thus, their findings tend not to apply in a typical health care setting. In contrast, translation research focuses on interventions that can be readily and easily applied in the "real world".

While there are similarities between etiological research and translation research, the major differences between them are in their emphasis. Translation research focuses on changing practices that improve care at the level of patient, provider, or health systems and can be generally applied across various setting. Etiological research, in contrast, focuses on understanding the causes, patient-level risk factors, and it emphasizes internal validity and controlled conditions. In addition, translation research emphasizes the absolute benefit of an intervention (in terms of its population-level impact), while etiological research tends to focus on relative risk ratios which only contrast the two groups being studied (one with the risk factor and one without).

The elements of care studied with translation research include, how the health care system is structured (e.g. single provider, group, hospital based), the processes of care (e.g. retinal and foot examinations, screening for cardiovascular risk factors) and the outcomes of care (e.g. visual impairment/blindness, amputations, cardiovascular disease). The goal is to achieve better process of care, better control of risk factors (e.g. A_{1C}, blood pressure, cholesterol) and ultimately, better clinical outcomes (e.g. cardiovascular, kidney, eye disease).

CONCLUSION

Despite our vast knowledge of how to prevent diabetes related morbidity and premature mortality, the level of diabetes care being delivered across the globe is well below what we need. Fortunately, opportunities currently exist to translate this knowledge into readily usable interventions that can be implemented into routine practice across all settings. Taking advantage of these opportunities, which is at the core of translation research, is essential if we are to turn the tide against the global pandemic.

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