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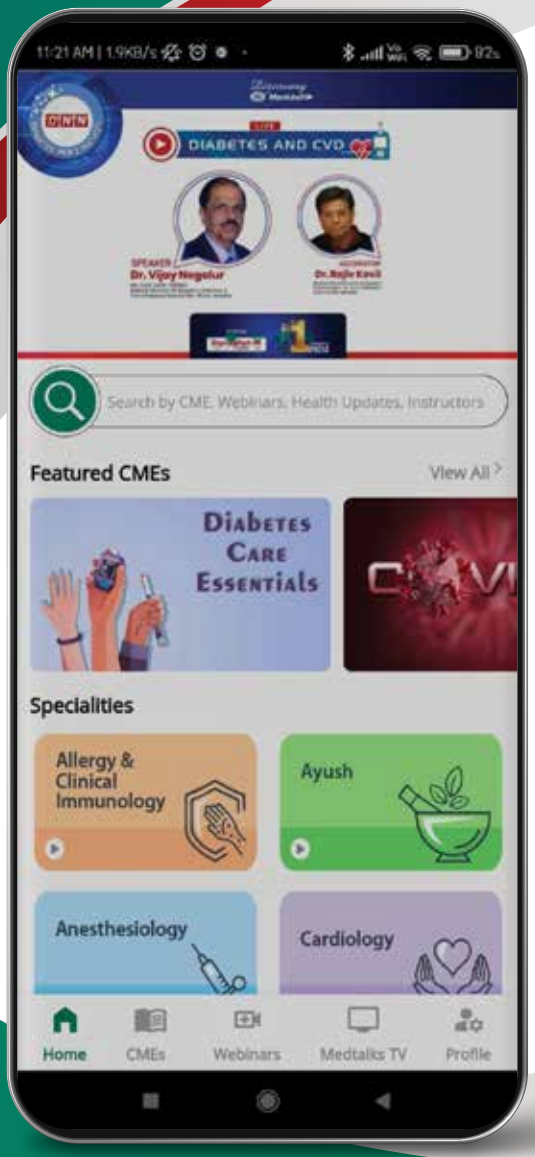

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Glycemic Guardianship: World Health Organization Leads the Way

A B S T R A C T

The prevalence of diabetes is rapidly increasing globally in epidemic proportions, but many people with diabetes remain undiagnosed or untreated. In view of this escalating prevalence, the World Health Organization (WHO) has launched the Global Diabetes Compact (GDC) campaign to improve the diagnosis and management of people with diabetes. To this end, a set of diabetes coverage targets, focusing on 80% of people living with diabetes, to be achieved by the year 2030, were defined at the 75th World Health Assembly for the first time in May this year. These targets aim to achieve not just glycemic control, but also blood pressure and lipid management at all levels of the health care system. India has the second largest number of people with diabetes in the globe. In this article, we have proposed the concept of "glycemic guardianship", which means activities carried out by the health care team and the health care system in partnership with the patient to ensure optimal care of diabetes. Recognizing and acknowledging our role as "glycemic guardians" of the nation will automatically pave the way to realize the targets set by the GDC.

Keywords: Diabetes, Global Diabetes Compact, coverage targets, World Health Assembly, glycemic guardians

Introduction

The Global Diabetes Compact (GDC) is a campaign launched by the World Health Organization (WHO), on the 100th anniversary of the discovery of insulin, to improve prevention, treatment and care for diabetes. Marking a first, the 75th World Health Assembly recently (May 2022) voted upon a contemporary set of diabetes coverage targets, that are to be achieved by the year 2030. This puts a stamp of approval upon the aims of GDC.[1]

Glycemic Guardianship

In concordance with the aims and objectives of GDC, we propose the concept of glycemic guardianship. Glycemic guardianship refers to the activities carried out by the health care team and health care system, to ensure optimal care of the person, or group of people, living with diabetes. Glycemic guardianship can be operational at a macro-(country/regional), meso-(health care system) or micro-(individual) levels. It is ideally carried out in partnership with the person(s) living with diabetes. Glycemic guardianship benefits from well laid out aims, which facilitate effective and efficient accomplishment of goals. This has been bolstered by the WHO targets, which provide an umbrella for all actions related to glycemic guardianship.

Challenges and Response

The five GDC targets cover screening and diagnosis, outcomes of care and access to affordable drugs as well as monitoring tools (Box 1). The targets reflect the need for comprehensive

Box 1. Targets for Diabetes Coverage, 2030

- Diabetes should be diagnosed in 80% of people living with the condition.
- Good glycemic control should be achieved in 80% of people diagnosed with diabetes.
- Blood pressure should be well-controlled in 80% of people diagnosed with diabetes.
- Statins should be taken by 60% of people with diabetes aged ≥40 years.
- Affordable insulin treatment should be accessible to 100% of people with type 1 diabetes.
- Affordable blood glucose self-monitoring should be accessible to 100% of people with type 1 diabetes.

vasculo-metabolic management and cardiovascular risk reduction in persons with diabetes. Without specifically mentioning particular groups, they call for attention to pediatric as well as mid-life and geriatric diabetes.

India is no stranger to the impact of the diabetes pandemic. With the second largest population of diabetes in the globe to care for,[2] the country's health care providers work hard to screen, diagnose, manage and prevent the condition. The increasing prevalence of the disease, however, offsets the advances that have taken place in diabetes care and its delivery.

This is the "Paradox of Plenty", where plentiful diabetes counteracts the potential of plenty of drugs and interventions that are available to treat the condition. Our policy makers and health care providers have understood that diabetes is now endemic in society, and have begun tailoring their responses accordingly. Diabetes care is embedded in the primary health care system, the National List of Essential Medicines, Indian Public Health Standards and the National Programme for Prevention of Non-Communicable Diseases.[3-5] Diabetes complications find mention in the Ayushman Bharat health insurance scheme,[6] though the basic uncomplicated treatment is not yet covered by it.

The Five Targets

Every journey has a destination, and milestones are necessary to assess our progress towards our goal. A similar situation exists in health care and in diabetes management.

The five targets laid down by GDC provide a roadmap for the Indian health care system. The law of two-thirds still operates in Indian diabetes epidemiology,[7] and a majority of people with diabetes remain undiagnosed, untreated or uncared for. Emphasis on screening and treatment, including not only glycemic but also blood pressure and lipid management, at every level of health care, is required. Glycated hemoglobin (HbA1c), a target for individual health, helps in risk stratification, choice of therapy and assessment of adequacy of treatment.[8] Use of statins as prophylaxis for cardiovascular disease should be encouraged, along with other interventions.[9]

Special Focus

Special focus on persons living with type 1 diabetes is also needed.[10] Insulin and glucose monitoring are essential for life, and these must be provided to all who need them. The Indian pharmaceutical industry is a world leader in manufacturing good quality drug at economical rates. Insulin is an essential drug, at national as well as WHO level and is now sold at Jan Aushadhi stores. Good quality glucose monitoring devices and ancillaries are also available, at economical rates. Integrated personalized diabetes management (IPDM) is being promoted, and glucovigilance has become an accepted part of diabetes care.[11]

Summary

Ownership of this concept should be with all diabetes care providers. Once we accept and acknowledge that we are glycemic guardians of our great nation, we will automatically begin to guard our glycemic health. This, in turn, will ensure that we accomplish the goals set by GDC, and much more.

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Health Technology Use in Noncommunicable Disorders: Challenges and Opportunities in India

A B S T R A C T

Health care in India is undergoing a rapid change from its historical focus on acute disease management to a focus more on chronic and continuous care-based model for non-communicable disorders. Health technology could be a game changer as it has a potential to optimize costs and effectively manage such operations. IT solutions are likely to become an integral part of process management, patient care and the hospital management information system in future. This brief communication describes the key enablers and limitations of using health technology in chronic diseases in developing countries like India.

Keywords: Health technology, non-communicable disorders, India, obesity, diabetes

Introduction

Technology is now embedded in many facets of daily life for large numbers of people across the world, and despite the fact that populations as a whole are increasingly tech-literate, the health sector has been hesitant in its approach to new technologies and inefficient in implementation of those with a strong evidence base. Health technologies can be powerful tools in supporting, expanding and enhancing all domains of health, including but not limited to: health care services, health surveillance, health education, research, prevention and patient treatment and management.[1] In addition, the convergence of health care with upcoming technologies like cloud computing and wireless technologies will improve accessibility and meeting the challenge of skilled manpower shortage.[2] Several projects in India and other developing countries are already underway to assimilate health technology with existing health infrastructure.[3] A recent study in rural India has shown that use of technology in the form of a mobile phone-based, nurse-facilitated clinical decision support system in primary care could improve the blood pressure and blood glucose control and has large potential to scale-up in resource-poor settings.

eHealth is defined by the World Health Organization (WHO) as use of information and communication technologies (ICT) for health, and includes the field of mHealth, which relates specifically to the medical or public health practices that are supported by mobile phones and other wireless devices. When member states of the WHO committed to work towards universal health coverage (UHC) in 2005, eHealth was made a priority in recognition of its "pivotal role" in achieving this

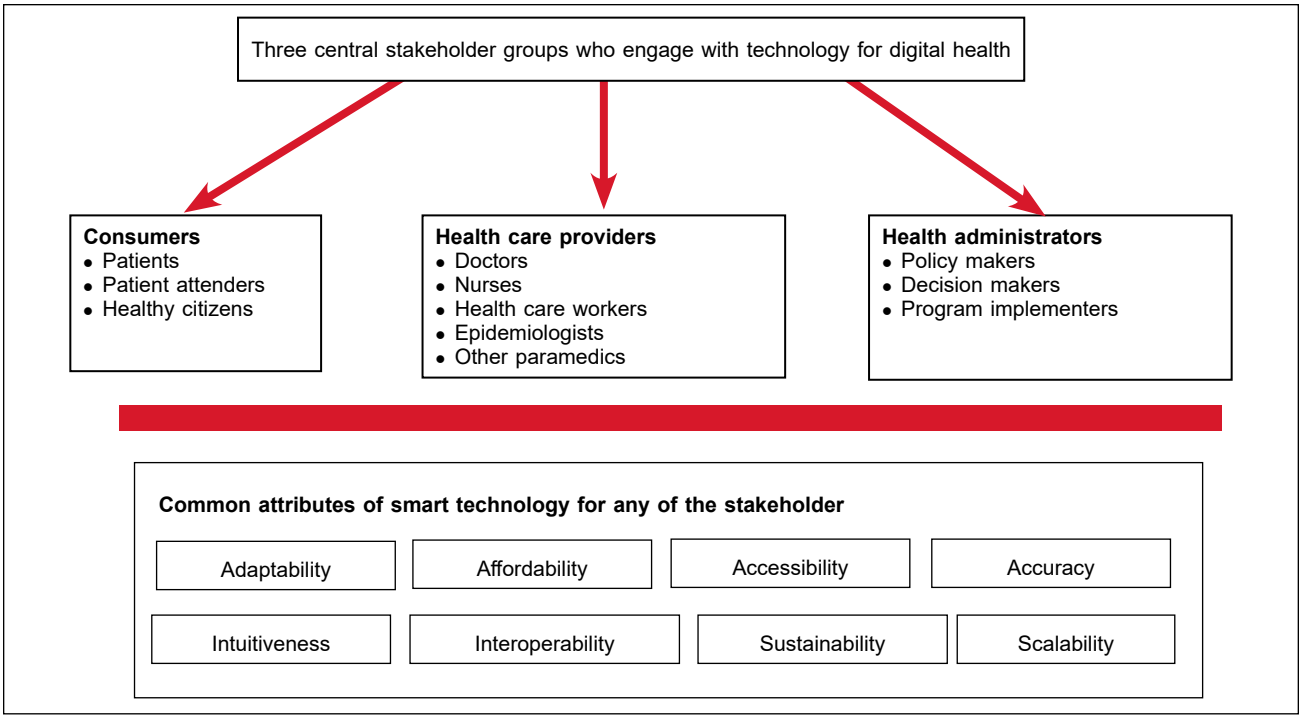

Figure 1. The key attributes for developing a successful program for health technology.

aim and indeed WHO's Report on the third global survey on eHealth, published in 2016, asserts that "It has become increasingly clear that UHC cannot be achieved without the support of eHealth."[4]

Enablers and Key Stake Holders of Health Technology

The key attributes for developing a sustainable and scalable model for health technology include to first define the problem with careful consideration of appropriate future integration into relevant health policies (Fig. 1). This should be followed by an appropriate identification of the technology users and the setting in which it has to be applied. And last but not the least, to use a highly iterative technology design and development process that incorporates the perspective of the user and also addresses scalability right from its inception.[5]

Obstacles for Use of Health Technology in India

There are diverse benefits of utilizing health technology in the evaluation and management of chronic conditions. However, there are challenges that need to be addressed to ensure widespread and maximal utilization of technologies in health care delivery. A major concern raised by experts on these programs is ensuring availability of high-quality care to most individuals utilizing these support systems. In addition, the high-cost that may be incurred in the development and dissemination of these technologies provides a challenge to health care institutions. More so in developing countries like India concerns regarding health literacy and poor electricity supply in remote areas were also raised in the forum.[6] Also, given the vast cultural and ethnic differences within the same country, it is important to tailor the use of technology to specific populations and settings.

Conclusion

The use of digital technologies to support the achievement of health objectives has been a 'hot topic' in public health for well over a decade. In that period, there have been rapid advances in computing and mobile technologies, matched by ever increasing access to these technologies and expansion of wireless and mobile networks. Although issues of equity cannot be ignored in cases where interventions require access to personal devices, other technologies have the potential to improve the equitable provision of health services to individuals and communities who are otherwise outside the existing health care services.

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ORIGINAL ARTICLE

Diabetes Risk Score in Indian Population: Experience from Central India

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ABSTRACT

Introduction: Diabetes is a major health problem in the world causing significant morbidity and mortality. Currently, 77 million people in India and 463 million people are living with diabetes across the world, and this number is expected to rise to 101 million in India and 578 million globally by 2030. The key to reduce the morbidity and mortality is early diagnosis and management. The Madras Diabetes Research Foundation (MDRF) has developed an Indian Diabetes Risk Score (IDRS) to identify people who are at risk of developing diabetes or are undiagnosed. Thus, we conducted a study to calculate the IDRS of people from Central India and identify those who are at risk of getting diabetes. **Methods:** A total of 1,500 patients or attendants, aged 18 to 60 years (mean age 41.2 years), visiting the Endocrinology clinic, and not diagnosed with diabetes earlier were included in the study after taking proper consent and IDRS was calculated. **Results:** The male-to-female ratio was 914:586. The mean IDRS was 51.29 in our population with 35.93%, 18.2% and 45.87% of screened subjects having a score of <30, 30-60 and ≥60, respectively. **Conclusion:** Forty-five percent people of the population was at high risk of diabetes as estimated by IDRS, which proved to be an effective and economical tool to identify persons at increased risk of diabetes and diagnose the undiagnosed cases and start early management to reduce the morbidity and mortality.

Keywords: Diabetes, Indian Diabetes Risk Score, Madras Diabetes Research Foundation

Introduction

Diabetes is a major health problem in the world leading to considerable morbidity and mortality. Prevalence of diabetes is expected to rise exponentially, currently 77 million people in India and 463 million people are living with diabetes across the world, and this number is expected to rise to 101 million in India and 578 million globally by 2030 which could mostly be attributed to unhealthy lifestyle, increasing life expectancy, illiteracy, lack of awareness and low socioeconomic status.[1] The key to reducing the morbidity and mortality is early diagnosis and management. The Madras Diabetes Research Foundation (MDRF) has developed an Indian Diabetes Risk Score (IDRS) to identify people who are at risk of developing type 2 diabetes or are yet undiagnosed.[2]

Thus, we conducted a study to calculate the IDRS of people from Central India and identify those who are at risk of getting diabetes or those who are not diagnosed with diabetes using IDRS.

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Material and Methods

This was an observational cross-sectional study conducted at our Endocrine Outpatient Department (OPD).

All patients or attendants visiting the Endocrinology OPD, willing and not diagnosed with diabetes earlier were included in the study after taking proper informed consent. Patients who were critically ill, pregnant, had history of diabetes or not willing to participate in the study were excluded.

A total of 1,500 volunteers were enrolled who met the inclusion criteria and IDRS was calculated as described in Table 1. We also recorded the random capillary glucose levels with glucometer and correlated it with IDRS. Glucometer reading of more than 140 mg/dL was considered deranged.

Results

One thousand five hundred volunteers, aged between 18 and 60 years (mean age 41.2 years) were included in the study. The male-to-female ratio was 914:586.

The mean IDRS in our study population was 51.29. Details of various risk factors are described in Table 1. And, 35.93%, 18.2% and 45.87% of the screened volunteers had a score of <30, 30-60 and ≥60, respectively (Table 2). Seven (1.29%), 23 (8.42%), 268 (38.95%) volunteers were identified with deranged blood glucose levels with IDRS of <30, 30-60 and ≥60, respectively (Table 3).

Discussion

Diabetes is a major health problem in the world. Early diagnosis and management can reduce the associated morbidity and mortality by preventing complications related to diabetes. There is a perceived need for a tool, which is not only economical but also socially acceptable and reliable to identify persons at risk of diabetes. MDRF has developed the IDRS, which has all the above-mentioned qualities to identify people who are at risk of developing diabetes or are undiagnosed type 2 diabetes. IDRS identified people as low-risk, moderate-risk or high-risk if score was <30, 30-60 or ≥60, respectively.

Hence, we calculated the IDRS in our population and identified the prevalence of various components of IDRS and correlated it with glucometer readings

Table 1. Prevalence of Various Risk Factors in Our Study Population

	Score	Male (n = 914)	Female (n = 586)	Total (n = 1,500)
Age (years)				
<35	0	281	207	488
35-49	20	343	224	567
≥50	30	290	155	445
Abdominal obesity				
Waist circumference (cm)				
<80 Female, <90 Male	0	401	145	546
80-89 Female, 90-99 Male	10	348	237	585
>90 Female, >100 Male	20	165	204	369
Physical activity				
Exercise (Regular) + Strenuous exercise	0	121	86	207
Exercise (Moderate)	10	387	149	536
Exercise (Mild)	20	147	291	438
No	30	259	60	319
Family history of diabetes				
No	0	134	175	309
1 Parent	10	568	281	849
Both parent	20	212	130	342
Maximum score	**100**	**51.25**	**51.37**	**51.29**

Table 2. Distribution of the Study Population According to the Risk Score

Score	Male (%)	Female (%)	Total (%)
<30	326 (35.76)	213 (36.34)	539 (35.93)
30-60	161 (17.62)	112 (19.11)	273 (18.20)
≥60	427 (46.72)	261 (44.45)	688 (45.87)
Total	**914**	**586**	**1,500 (100)**

Table 3. Correlation Between IDRS and Deranged Blood Glucose Profile

Score	N (%)	Deranged blood glucose (RBS >140 mg/dL or FBS >100 mg/dL with glucometer [% of cases])
<30 (Low)	539 (35.93)	7 (1.29)
30-60 (Moderate)	273 (18.20)	23 (8.42)
≥60 (High)	688 (45.87)	268 (38.95)

for capillary glucose levels. In our study, the mean IDRS was 51.29 suggesting that our population is at moderate-risk for diabetes; 35.93%, 18.2% and 45.87% of screened volunteers had a score of <30, 30-60 and ≥60, respectively.

Nandeshwar et al in their study in 2010 identified 2.80% subjects as low-risk, 28.40% as moderate-risk and 68.80% as high-risk as per the IDRS.[3] This increase in low- to moderate-risk group and decrease in high-risk group population may be because of increasing awareness among people regarding diabetes and its complications due to several awareness programs and activities conducted by medical fraternity.

Seven (1.29%), 23 (8.42%), 268 (38.95%) volunteers were identified with deranged blood glucose levels with IDRS of <30, 30-60 and ≥60, respectively. Our findings were also in concordance with those of Mohan et al, which suggested that only 43% population with IDRS ≥60 need to be screened for diabetes, which will help in significant reduction in financial burden.[2]

Conclusion

Forty-five percent people of our population is at high risk of diabetes as estimated by IDRS, which is an effective and economical tool to identify the people who are at increased risk of diabetes and diagnose undiagnosed people with diabetes.

Thus, we recommend regular use of IDRS to identify people at increased risk of diabetes and screen them for diabetes and its complications to start early management and reducethe diabetes-related morbidity and mortality.

Limitation of Study

Possibility of sample bias cannot be ruled out as volunteers were from single tertiary care center.

Conflict of Interest

Declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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REVIEW ARTICLE

Association of Fructose Enriched Foods with Metabolic Syndrome and Cardiovascular Diseases

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ABSTRACT

Cardiovascular diseases (CVDs) are the major causes of mortality and morbidity worldwide as well as in the Indian subcontinent, causing more than 25% of deaths. It has been predicted that these diseases will increase rapidly in India, making it a host to more than half the cases of heart disease in the world within the next 15 years. The World Health Organization (WHO) reports that in the year 2005 CVDs caused 17.5 million (30%) of the 58 million deaths that occurred worldwide. In the recent times, the association of metabolic syndrome (MS) is strongly linked with CVDs. MS is defined as a constellation of metabolic disorders in an individual. The main components of MS are dyslipidemia (higher triglyceride, low-density lipoproteins [LDL] and low high-density lipoproteins [HDL]), elevated blood pressure (BP), dysregulated glucose homeostasis, abdominal obesity and insulin resistance. Being one of the most widespread diseases in the world, almost half of the population of specific age groups in developed countries is affected by it. Studies have shown that the independent risk factors associated with MS increase the likelihood of CVDs. It has been postulated that excess intake of fructose promotes cell dysfunction, inflammation, intra-abdominal (visceral) adiposity, atherogenic dyslipidemia, weight gain, insulin resistance, hypertension thereby aggravating the chances for developing MS, type 2 diabetes and coronary heart disease.

Keywords: Cardiovascular diseases, metabolic syndrome, dyslipidemia, abdominal obesity, fructose, insulin resistance

Introduction

As the engines of health transition gather pace, the epidemic of cardiovascular diseases (CVDs) is accelerating globally, advancing across regions and social classes. CVDs, one of the noncommunicable diseases have become the major public health problem in developed and developing countries. Globally CVD deaths represent about 30% of all deaths. As per the World Health Organization (WHO) reports, it is predicted that almost 23.6 million people will die from CVDs, mainly from heart disease and stroke by 2030, both becoming the single leading cause of death. Different studies are throwing light on the diseases associated with increased CVD risk such as metabolic syndrome (MS) as with lifestyle changes new and

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more complex disease conditions have emerged. The new millennium is witnessing the emergence of a modern epidemic, i.e., MS, with frightful consequences to the health of humans worldwide and its associated comorbid conditions. Studies have shown that MS patients possess a significantly greater risk for the development of CVD in general and coronary artery disease (CAD) in particular, studies have even reported a positive correlation between MS and carotid atherosclerosis.

The etiology of CVD in patients with MS may involve: coronary atherosclerotic disease, arterial hypertension, left ventricular (LV) hypertrophy, diastolic dysfunction, endothelial dysfunction, coronary microvascular disease and autonomic dysfunction.

The pathogenesis of CVD in the MS is multifactorial as it can be caused by one or more factors associated with this condition such as the systemic abnormalities, insulin resistance, diabetes and/or inflammation. It is seen that each component of MS independently affects cardiac structure and function, but their combination under this syndrome seems to carry additional risk.

MS is a complex disease bearing a high socioeconomic cost and being considered as a major epidemic worldwide. Although many definitions and classifications of MS are available two definitions in the widespread are used globally; one proposed by the WHO and other by the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) (Table 1).

Broadly MS is defined as concurrence of overweight, abdominal fat distribution, dyslipidemia, disturbed glucose and insulin metabolism and hypertension (Fig. 1), historically the concept of MS dates back to 1988 when Reaven for the first time had put forward the concept of syndrome X, which was later named as MetS. However in 1999, WHO introduced the term 'metabolic syndrome' to include the cluster of factors as a clinical entity. Recent studies have also added other abnormalities such as chronic pro-inflammatory, hyperuricemia, prothrombogenic states, nonalcoholic fatty liver disease (NAFLD) and sleep apnea to the entity of this syndrome making its definition even more complex. Along with being a risk factor for CVDs, MS even predisposes an individual

Table 1. Consensus Definitions from Different Associations on Metabolic Syndrome

National Cholesterol Education Program-Adult Treatment Panel III, 2001	American Heart Association/ National Heart, Lung and Blood Institute Scientific Statement, 2005	International Diabetes Federation, 2006	Harmonizing the Metabolic Syndrome, 2009
Three or more of the following:	Measure (any 3 of 5 constitute diagnosis of metabolic syndrome)	Central obesity as defined by ethnic/racial, specific WC and two of the following:	Three or more of the following:
WC >102 cm for men, >88 cm for women	WC >102 cm in men, >88 cm in women	Triglycerides ≥150 mg/dL	Central obesity as defined by ethnic/racial, Specific WC
Triglycerides ≥150 mg/dL	Triglycerides ≥150 mg/dL or on drug treatment for elevated triglycerides	HDL-chol <40 mg/dL for men; <50 mg/dL for women	Triglycerides ≥150 mg/dL or on drug treatment for elevated triglycerides
HDL-chol <40 mg/dL in men; <50 mg/dL in women	HDL-chol <40 mg/dL in men; <50 mg/dL in women or on drug treatment for reduced HDL-chol	BP ≥130/85 mmHg	HDL-chol <40 mg/dL in men; <50 mg/dL in women or on drug treatment for reduced HDL-chol
BP ≥130/85 mmHg	BP ≥130/85 mmHg or on antihypertensive drug treatment in a patient with a history of hypertension	FPG ≥100 mg/dL	BP ≥130/85 mmHg or antihypertensive drug treatment
FPG ≥110 mg/dL	FPG ≥100 mg/dL or on drug treatment for elevated glucose		FPG ≥100 mg/dL or on drug treatment for elevated glucose

WHR = Waist-to-hip ratio; WC = Waist circumference; BP = Blood pressure; FPG = Fasting plasma glucose; Chol = Cholesterol.

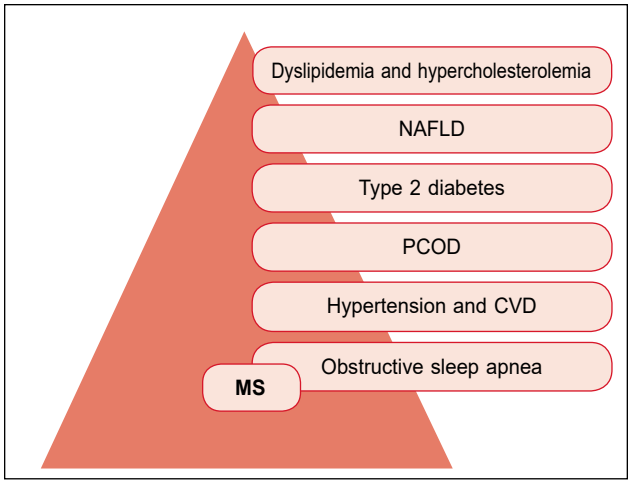

Figure 1. Metabolic syndrome and its associated disorders.

to a greater risk for developing type 2 diabetes. Changes in human behavior, high energy fast food environment, sedentary lifestyle, have recently been attributed to be associated with progression towards MS.

In the present world, there has been an augmented understanding of MS and its associated diseases followed by a subsequent increase in clinical attention directed towards its prevention, due to its strong association with premature morbidity and mortality. Numerous studies have reached to the consensus now that insulin resistance and obesity are main determining factors involved in the common pathologic mechanism of the MS and its associated comorbid conditions. Evidences have suggested that the progression towards MS begins early in life and with persistence from childhood to adolescent/ adult life results in type 2 diabetes, CVDs and other associated diseases.

The symptoms of MS develop over a predisposed background thought to be established at a young age and are not necessarily manifestations of age, recent trends in modern diets, habits, lifestyle changes likely influencing health and behavior in increasingly younger populations makes up for a dangerous predisposition.

Pathophysiology of Metabolic Syndrome and CVD Progression

Understanding the pathophysiology responsible for MS will prove to be a beneficial aid for best treatment options. While the exact mechanisms responsible for increased CVD risk have not been elucidated, studies have thrown light on insulin's action and the role of

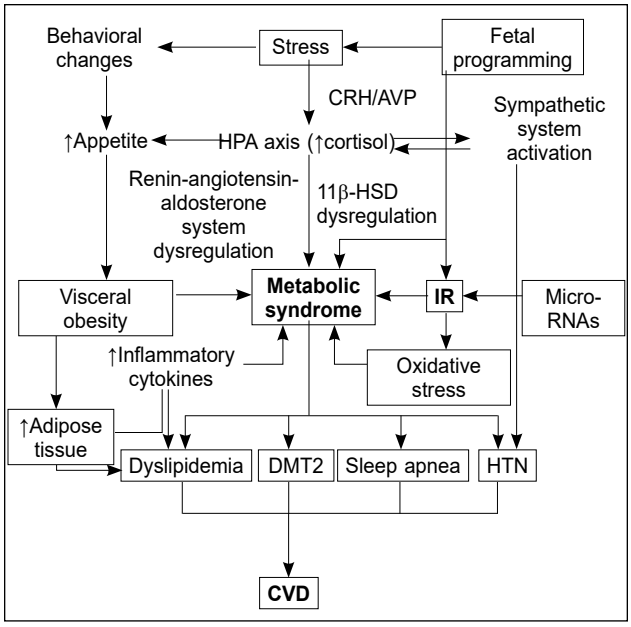

Figure 2. Metabolic syndrome and CVD progression.

obesity and its associated pathological mechanisms (Fig. 2). The excess adiposity associated with MS plays an important role towards the progression of MS associated CVD. Obesity especially abdomino-visceral, is associated with certain pathogenic factors that contribute to normal glucose homeostasis: high plasma levels of free-fatty acids (FFAs), increased hepatic glycogenesis and peripheral insulin resistance. It is seen that in obesity, cytokines mediated release of inflammatory molecules such as tumor necrosis factor (TNF)-α, interleukin (IL)-6, plasminogen activator inhibitor (PAI), C-reactive protein and resist in occurs from adipose tissues and immune cells due to the initiation of a chronic inflammatory state via cytokines. The link between obesity and inflammation stems from the fact that pro-inflammatory cytokines are over expressed in obesity, this inflammatory process acts as a homeostatic mechanism to prevent the accumulation of excess fat. It is established that the starting signal for inflammation in obesity is overfeeding and the pathway origins in all metabolic cells e.g., in adipocyte, hepatocyte or myocyte.

Clinical and non-clinical studies have shown that consumption of nutrients may acutely evoke inflammatory responses, furthermore metabolic cells such as adipocytes respond to this insult by beginning inflammatory response. It is seen that lipid storage and weight increase requires an anabolic process while inflammation stimulates catabolism including lipolysis, as a result due to chronic lipolysis FFAs are liberated continuously and are further transferred via portal vein

to liver. Studies have shown that increased plasma FFAs along with inflammatory cytokines trigger a response that results in decreased insulin sensitivity in tissues that depend on insulin which is caused by inhibition of receptor signaling, this situation is also referred to as insulin resistance (IR) further leading to increased insulin synthesis and secretion by β pancreatic cells and resulting in compensatory hyperinsulinemia, following it FFAs are oxidized simultaneously in the liver, triggering neoglucogenesis and thus increasing glycemia. Concomitantly, there is an increase in the synthesis of very low-density lipoproteins (VLDLs) that further generate small, dense atherogenic LDLs.

Studies have shown an extensive role of TNF-α in the systemic inflammatory response triggered by obesity, it is seen that within adipose tissue macrophages account for maximum TNF-α production and it has also been seen that TNF-α expression levels are higher in obese patients, a link between increased levels of circulating TNF-α levels and IR has been established. The pathway of IR via TNF-α occurs through serine phosphorylation (inactivation) of both the insulin receptor and insulin receptor substrate-1 (IRS-1), as a result a diminished activation of phosphoinositide 3-kinase (PI3K) occurs which is a main governing molecule of insulin's metabolic effects. One of the mechanisms by which TNF-α is thought to trigger IR is via activation of nuclear factor-κB (NF-κB) signaling, which further results in activation of inflammatory cascade. Another mechanism by which TNF-α is thought to contribute to IR is through the elevated levels of circulating FFAs caused by induction of lipolysis and stimulation of hepatic lipolysis; however, this mechanism has only preliminary supporting evidence and extensive studies are needed to completely validate the findings.

Studies have depicted that insulin's action also plays a crucial role towards CVD progression in MS patients. Deedwania in his study; noted that insulin's action can lead to hypertension via stimulation of vascular smooth muscle cell hypertrophy; in addition, insulin could also cause hypertriglyceridemia and high-density lipoprotein (HDL) cholesterol through increased catecholamines. It is also reported that insulin can lead to secretion of prothrombogenic PAI-1.

Studies have shown that hyperinsulinemia may even lead to increased sensitivity to angiotensin II, which further could result in increases in cell growth, PAI-1, intracellular adhesion molecule-1, etc. Defects in insulin sensitivity may interfere with insulin-stimulated vasodilation. IR is also associated with endothelial dysfunction, which is characterized by impaired endothelium-dependent vasodilation, reduced arterial compliance and accelerated process of atherosclerosis. Along with obesity and IR, studies have even thrown light on the role of matrix metalloproteinase (MMPs) in MS and associated CVDs. Progression towards MS associated CVD begins via alterations of the arterial vasculature, which begins with endothelial dysfunction and lead to micro- and macrovascular complications. It is seen that remodeling of the endothelial basal membrane that promotes erosion and thrombosis occurs due to multifactorial pathogenesis that includes leukocyte activation, increased oxidative stress and also an altered MMP. Being endopeptidases, the primary role of MMPs is to degrade matrix proteins, such as collagen, gelatins, fibronectin and lamin, and can be secreted by several cells within vascular wall. The activity of MMPs is regulated by tissue inhibitors of MMP (TIMPs) and also by other molecules, such as plasmin. The role of MMPs in plaque instability causing serious vascular complications has been reported in several studies. It has been demonstrated that an impaired MMP or TIMP expression is associated with higher risk of all-cause mortality.

In the recent years, MMPs have garnered considerable interest due of their association with many disease conditions. It is seen that different components of the MS provide an impetus for MMP synthesis and even their activity; these include hypertension, dyslipidemia, hyperglycemia, pro-inflammatory and pro-oxidant markers, on the other hand, anti-inflammatory cytokines like adiponectin are inversely associated with MMPs. Extensive studies have come up to the conclusion that among the several MMPs collagenases (MMP-1 and MMP-8) and gelatinases (MMP-2 and MMP-9) are strongly associated with MS progression and its associated diseases, even few studies targeting MMPs in patients coronary diseases and diabetes and have shown fruitful results. In the near future, targeting MMPs and their activators can prove beneficial in treating and understanding the MS complexity and its associated diseases.

Nutritional Factors Influencing Metabolic Syndrome

In the recent times, a trend towards the shift in the energy balance accompanied by sedentary lifestyle and increased caloric intake is gathering considerable importance, and is being attributed to technological advances and improved economic status in Western countries and even developing countries. Studies have shown that the Westernization of diets, along with high calorie foods is certainly becoming an important

contributor to MS epidemic, and the increased incidence of the MS now even threatens developing countries.

In the past, physicians and scientists have made an association between dietary energy from fat and body fat, following which a large market is being popularized and promoted for low fat diets, interestingly however, the decline in dietary fat consumption has not corresponded to a decrease in obesity in fact, an opposite trend has emerged. It is seen that diets high in saturated fats induce weight gain, IR and hyperlipidemia in humans and animals. Despite putting effortless emphasis on fat reductions no significant benefits relative to the obesity epidemic have emerged, increasing evidence now suggests that the rise in consumption of carbohydrates, particularly refined sugars high in fructose, appears to be at least one very important contributing factor. Recent epidemiological and biochemical studies clearly suggest that high-fructose intake may play an important role in progression towards MS.

At present, the market is flooded with large quantities of popular, convenient, prepackaged foods, soft drinks and juice beverages containing sucrose or high-fructose corn syrup. Fructose, which is found naturally in many fruits, is now consumed by humans in large quantities in the commonly available popular foods. Studies have shown that an approximate 25% increase in per capita fructose consumption over the past 30 years clearly co-exists, which increase in the prevalence of obesity and MS; high-fructose diets have been shown to induce IR, weight gain, hyperlipidemia and hypertension in several animal models including rats, hamsters and dogs.

In human studies, fructose consumption is seen to be associated with the development of hepatic and adipose tissue IR and dyslipidemia due to its ability to induce hepatic *de novo* lipogenesis (Fig. 3). Different biomechanical studies have suggested that sugar consumption causes adverse effects because of rapid hepatic metabolism of fructose which is catalyzed by fructokinase C, which further results in increased uric acid levels and even generates substrate for *de novo* lipogenesis.

Studies have shown glucose transporter 5 (GLUT5) present at the brush border and basolateral membranes of the jejunum aids in the absorption of fructose from the intestine into the portal blood; as a result massive fructose uptake by the liver occurs via this route. It is noted that the hepatic metabolisms of both glucose and fructose are different; fructose is phosphorylated by fructokinase, forming fructose-1-phosphate, which can then be converted to several three-carbon molecules, including glyceraldehyde, dihydroxyacetone phosphate and glyceraldehyde 3-phosphate. It is seen that some of these three-carbon molecules via the process of gluconeogenesis could be converted to glucose, or could also be used to generate other products such as triglycerides (TGs), which further can be packaged into VLDL by the liver. As VLDLs travel through the bloodstream, TGs can be hydrolyzed by lipoprotein lipase to form nonesterified fatty acids (NEFAs) and monoacylglycerol, which are further taken up by adipose tissue and resynthesize to TGs, therefore excessive fructose consumption can lead to high levels of FFAs and obesity. It is already stated that the role of the adipose tissue is to take up FFAs and store it in the form of TGs, however in obesity it is seen that this storage capacity reaches to its maximum resulting in an impaired ability of adipose tissue to acquire dietary fatty acids, as a result increased levels of fatty acids occurs in circulation.

Studies have shown that signaling abnormalities in adipocytes can also trigger lipolysis of TG stores resulting in efflux of fatty acids into the bloodstream thereby augmenting the problem. Few studies have thrown light that high levels of NEFAs in the bloodstream have a positive correlation between obesity, IR, type 2 diabetes and metabolic dyslipidemia, these NEFAs are eventually taken up ectopically by nonadipose tissues such as the liver and skeletal muscle, where they may be stored as TG or diacylglycerol and interfere with metabolic pathways such as the response to insulin, contributing to IR and MS. Numerous studies have shown that the build-up of lipids in the liver and other tissues in obesity contributes to an increased mitochondrial oxidation of fatty acids, further generating peroxidation products that stimulates IκB kinase (IKK)β and, therefore, NF-κB activation. Various studies have even found a correlation between fatty acid or lipid treatment and NF-κB activation. Under

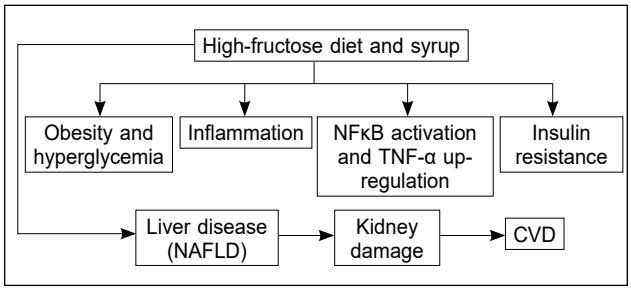

Figure 3. High-fructose consumption and its associated effects.

basal conditions NF-κB is found in the cytosol bound to its inhibitor, IkB, but upon activation of IKKβ, which phosphorylates IkB and marks it for degradation, NF-κB is allowed to enter the nucleus, where it induces transcription of specific genes.

The proteins encoded by these genes include pro-inflammatory cytokines such as PAI-1, TNF-α, IL-6 and IL-1β; however, the mechanisms responsible for IKKβ and NF-κB activation in obesity are unclear. TNF-α being a mediator of inflammation and immune response is a versatile cytokine that alters tissue remodeling, epithelial cell barrier permeability, activation of macrophages and recruitment of inflammatory filtrates different downstream signaling cascades activated by TNF-α have been elucidated. TNF-α, by binding to various receptors such as TNFR1 results in the activation of various transcription factors e.g., NF-κB as well as intrinsic and extrinsic apoptotic cascades mediated by caspase-8 and cytochrome C.

Recent studies have shown the involvement of TNF-α in mitochondrial membrane destabilization, resulting in formation of pathological pores causing mitochondrial permeability transition thereby activating the intrinsic pathway of apoptosis mediated by cytochrome C in many diseases. Numerous nonclinical studies have delineated the effect of fructose and its associated activated pathological pathways on the progression towards MS associated CVDs in rodents. In a study, Shiu et al delineated the apoptotic and antisurvival effects on rats hearts when administered high fructose diet (HFD). It was seen that rats on HFD besides having elevated levels of all MS markers, had abnormal myocardial architecture, enlarged interstitial space and increased cardiac apoptotic cells. The role of intrinsic and extrinsic apoptotic markers such as Fas-dependent apoptotic proteins (TNF-α, TNFR1, Fas ligand, Fas receptor, FADD, activated caspase-8 and activated caspase-3), mitochondria dependent apoptotic proteins (Bax, Bak, Bax/Bcl-2, Bak/Bcl-xL, cytosolic cytochrome C, activated caspase-9 and activated caspase-3) was delineated in the study. Rats on HFD had up-regulated levels of the above stated markers. Further cardiac insulin-like growth factor 1 (IGF-1-related survival proteins (IGF-1, IGF-1R, p-PI3K and p-Akt) and Bcl-2 family associated pro-survival proteins (Bcl-2 and Bcl-xL) were down-regulated in rats on HFD.

Parks et al and Katan et al, showed in their short-term studies that diets rich in carbohydrates, particularly sugars (sucrose, fructose) resulted in increase in serum triacylglycerol concentrations and decreased HDL concentration, therefore indicating a risk towards developing CVD. Few studies have also thrown light on the involvement of various oxidative stress markers (nicotinamide adenine dinucleotide phosphate or NADPH) and pro-inflammatory cytokines (IL-1, IL-6) and hypothesize a possible role of NF-κB and TNF-α in the progression of MS thereby leading to CVDs. Numerous studies have found that dietary composition of carbohydrate can result in development of left ventricular hypertrophy and cardiac pathology. It is believed that with increased concentrations of fructose diets the trend towards CVD risk will markedly rise in near future.

Conclusion

With rising financial implications and with a concomitant impact on human health, MS in the recent past has gathered considerable concern; its presence is an important risk factor for the development of CVDs and type 2 diabetes. At present, the key principles involved in the management of patients with MS are early identification of patients, effective treatment regular follow-up, pharmacological therapy and lifestyle modifications. In the current scenario, the mechanisms that contribute to MS associated diseases remain unclear, extensive research is underway that might help in understanding the pathological pathways and novel treatment options. The most important contributory factors which have emerged as the important links in MS are sedentary lifestyle, altered dietary requirements and obesity.

The consumption of fructose has increased, largely because of an increased consumption of soft drinks and many juice beverages containing sucrose or high-fructose corn syrup. Dietary high-fructose intake has been suggested to be an important factor contributing to the development of symptoms of MS. Recent evidence suggests that fructose feeding in rats develops the features of the MS model in many of the same pathophysiological deficits as noted in MS in humans, such as IR, dyslipidemia, hyperinsulinemia, hypertricylglycerolemia, impaired glucose tolerance, increased uric acid levels, hypertension, myocardial functional abnormalities and heart failure. If not alarmed and the different economies do not make necessary interventions to the growing MS epidemic, individuals from all age groups will be severely affected limiting their full overall development and progression.

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CONTEMPORARY ARTICLE

Motivating Persons Living with Diabetes for Insulin/Injectable Therapy

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ABSTRACT

Motivating patients to initiate or intensify insulin is a challenging aspect of diabetes practice. This paper reviews certain motivational strategies and methods used for insulin initiation/intensification. It places various domains of motivational interviewing in perspective, under a single umbrella, making it easier for practitioners to understand the art and science of insulin motivation.

Keywords: Diabetes, insulin therapy, patient-centered care, person-centered care, psychosocial aspects

Introduction

A large proportion of patients with diabetes is poorly controlled, and suffers an unnecessary burden of poor glycemic control before their therapy is up-titrated or intensified.[1] While many reasons have been put forward for this clinical inertia, one of the major reasons is physician's inability (or their self-perceived inability) to motivate patients to initiate or intensify insulin therapy.[2]

The model we share in this article is being used with success at our centers. It is a simple and easily replicable method, which can be learnt by physicians and paramedical staff alike, and used in resource-limited or time-challenged settings as well as in optimal health care environments.

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Insulin Motivation – 'WATER' Approach

The WATER approach[3] is a mnemonic coined for a method of motivational interviewing (MI) used at our centers. It is a checklist designed to remind the health care practitioner about the basics of MI, and to ensure good quality provider – patient bonding so that optimal therapeutic outcomes are achieved (Box 1).

Box 1. The WATER Approach

W – **Welcome warmly**	• Body language • The OPD encounter
A – **Ask and assess**	• Identifying and using cues • Internal, external, laboratory • Hierarchy of questioning • The insulin encounter
T – **Tell truthfully**	• Mid-Sentence analysis • Verbal/Nonverbal cues • Analogy building
E – **Explain with empathy**	• Examples/Experience– sharing • Demonstration • Coping skills training
R – **Reassure and return**	• Agree upon the next visit/contact • End with positivity

W stands for 'Welcome warmly', which reminds the health care provider (HCP) to greet the patient, with genuine warmth, in a gender, age- and socio-culturally appropriate manner.

Body Language

The physician should make a conscious effort to learn the nuances of body or nonverbal language, make the patient feel at ease, diagnose his or her level of comfort, and plan further conversation or therapeutic intervention. A pleasant greeting is followed by a detailed history taking, reflected by A for Ask and Assess. The patient is asked for his or her perception of diabetes. History is accompanied by an assessment of barriers to insulin therapy, cues[4] (such as concerns, symptoms, signs, laboratory reports and external influences), which may stimulate insulin use and felt needs of the patient.

Hierarchy of Questioning

Using the correct order of questioning is of utmost importance in history taking, if one wants to motivate a major change in health-related behavior, e.g., insulin use. While conversing, one should slowly move from the patient's comfort zone to his or her non-comfort zone, from non-personal to personal, from familiar to unfamiliar. One should first identify and/or create a major felt need, and then position insulin as the treatment for that need, while focusing on its positive benefits.

A conversation where the doctor asks about sexual function or financial issues before talking of weight loss or asthenia will be not welcomed by most patients.

Cues

The motivation model utilizes 'internal' and 'external' cues, gleaned from an intensive history taking, and 'laboratory' cues, taken from investigation reports, for insulin motivation. Internal cues are signs and symptoms, which have a high index of perceived severity, or are a 'felt need' for the patient, such as a frozen shoulder, recurrent urogenital infection or weight loss. External cues may be motivation by 'social' or 'environmental' factors. An impending or developing renal failure due to diabetes, or a child learning about the complications of diabetes at school, may act as a factor for insulin acceptance. Laboratory results such as a high HbA1c or a high vibration perception threshold on biothesiometry can be utilized for insulin motivation.

Mid-Sentence Analysis

During the process of "asking and assessing", one can keep a close watch on the patient's verbal language or nonverbal cues, to assess the patient attitudes towards insulin. For example, one can start a sentence as "Guidelines tell us to begin insulin in you ……" and wait to see the patient's response. If he or she moves backwards or says "But I will never take insulin!" or makes a wry face, the sentence can be completed as "……. but let us try tablets for 2 weeks. Do you mind taking an expensive tablet with only 2 years history of experience?"

If on the other hand, the patient keeps a neutral stance and facies, one can complete the conversation as: "…, so let us begin twice daily insulin."

Such a mid-sentence analysis is an effective tool of reducing "counseling casualties" and getting resistant patients to gradually accept insulin or other appropriate therapy.

One should T (Tell the truth) to the patient after having assessed his needs. The truth or HCPs clinical opinion should be told in an appropriate manner, described as the five-pointed CARES approach (Box 2). These are the five attributes, which a diabetes care professional must possess.[5]

Telling the truth alone is not enough; one should Explain the situation with empathy. Explanation is accompanied by analogy building,[6] quotation of examples and use of demonstration devices. Cues gleaned during history are utilized to provide a starting point for patient engagement, and given back to patients, paraphrased as suggestions or solutions.

The last step is R (Reassure and Return). Reassurance is essential to ensure that the patient returns for follow-up.

The physician may not succeed in motivating the patient for insulin or injectable therapy during the first OPD encounter, but will at least shift him or her from the pre-contemplation to the contemplation phase (Prochaska's theory of knowledge).[7]

Box 2. The CARES Approach

Confident Competence
Authentic Accessibility
Reciprocal Respect
Expressive Empathy
Straightforward Simplicity

Experience – Sharing with Peers

Most oriental cultures encourage sharing of illness-related experiences with friends and community. Health is usually not reviewed as a private matter, unlike in western cultures. Depending upon social mores, one can use examples of successful insulin initiators in the community to encourage insulin initiation and intensification.

Coping Skills Training

Reassurance is combined with coping skills training (CST), which helps the patient handle the stress of diabetes in a better manner.

Coping skills training is a method of improving the method(s) by which a person responds to a seemingly insurmountable challenge (for example, living with diabetes, controlling diabetes). Each and every person has both positive and negative coping skills. Our model of diabetes counseling focuses on diagnosing a particular patient's coping methods. One should begin by Asking and assessing the individual's current coping styles. This gives an idea of the negative skills which have to be Eliminated, before positive coping mechanisms can be Introduced and Internalized. These changes have to be Observed on a Ongoing basis, so that one can continually Upgrade one's Understanding and health care-related behavior. This has been termed the AEIOU approach.[8] Table 1 lists the common coping styles that can be identified and optimized.

Table 1. Coping Styles

Negative	• Blaming oneself, e.g., I have developed diabetes because of sins in my past life • Blaming others, e.g., my sister didn't take care of me so I developed high blood pressure • Extremely bad thoughts, e.g., I will die due to high glucose • Pervasive bad thoughts 24 x 7, e.g., Thinking only and only about diabetes throughout the day
Neutral	• Acceptance, e.g., I accept that diabetes and insulin are a part of my life
Positive	• Put in perspective, e.g., Let me count my blessings and strengths • Positive spin-off, e.g., Insulin will make me more disciplined in my life • Pleasant thoughts, e.g., May be I will make new friends at the next diabetes advocacy meeting • Plan for the future, e.g., Let me begin saving money to buy an insulin pump

Reducing Discomfort of Change

One should always strive to reduce the discomfort associated with change.[9] Simple steps such as building a rapport with the patients, abbreviating bad news, and expanding good news, making change appear as if it were a choice, handing overcharge to the patient, and breaking the change into small bits, help in reducing the discomfort associated with change of lifestyle or pharmaceutical modality.

Conclusion

This article tries to encapsulate, under one umbrella, the various facets of patient motivation for insulin or injectable therapy in people with diabetes. It should sensitize physicians and other diabetes care professionals to the science behind the art of insulin motivation, and help improve the quality of care provided to persons living with diabetes, by reducing clinical inertia as well as patient resistance related to insulin usage.

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CASE REPORT

Cocktail Inferno – Multiple Sclerosis with Type 2 Diabetes Mellitus in a Patient with Lepromatous Leprosy

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A B S T R A C T

Co-occurrence of multiple sclerosis with type 2 diabetes mellitus with lepromatous leprosy is rare. We hereby report a case of multiple sclerosis with type 2 diabetes mellitus with lepromatous leprosy in a middle-aged female. She was clinically diagnosed as having multiple sclerosis with type 2 diabetes mellitus and presented with fever, ENL and neuritis. Her MRI reports were normal but she had a positive slit-skin smear and skin biopsy as lepromatous leprosy. Proceeding with this diagnosis, she was treated with baclofen for spastic bladder, antibiotics for urinary tract infection, oral hypoglycemic agents and oral steroids with multibacillary treatment for leprosy with type 2 reactions. She responded well and currently is being followed-up.

Keywords: Multiple sclerosis, leprosy, diabetes mellitus, demyelinating neuropathy

Introduction

Multiple sclerosis is a disorder with heterogeneous clinical and pathologic features reflecting various pathways to tissue injury.[1] Inflammation, demyelination and axonal degeneration are the key pathologic mechanisms, which lead to clinical manifestations.[2,3] However, the cause of multiple sclerosis remains unknown.[4,5] The most widely accepted theory suggests that it begins as an inflammatory immune-mediated disorder characterized by autoreactive lymphocytes.[1,6] Later, the disease is dominated by microglial activation and chronic neurodegeneration.[2]

Leprosy (Hansen's disease) is an infectious disease caused by *Mycobacterium leprae* that involves the skin and peripheral nerves. Early diagnosis and a full course of treatment are critical for preventing lifelong neuropathy and disability.[7] Although the infection is highly responsive to treatment, leprosy became an important global health concern due to deformities and disabilities of the eyes, hands and feet secondary to neuropathy which are often irreversible and require lifelong care and rehabilitation. Therefore, early diagnosis and management are necessary to minimize the likelihood of these disabilities.[8]

Type 2 diabetes mellitus is characterized by hyperglycemia, insulin resistance and relative impairment in insulin secretion. It is a common disorder with a prevalence that rises markedly with increasing degrees of obesity.[9]

The prevalence of type 2 diabetes has risen alarmingly in the past decade,[10] in large part linked to the trends in obesity and sedentary lifestyle.[11]

Case Report

A 55-year-old female was brought by her relatives to the skin department. She had flexor spasms, difficulty in walking, spastic bladder with an indwelling catheter since last 4 years and was diagnosed to have multiple sclerosis. She had multiple admissions for fever and urinary tract infection and was on oral hypoglycemic

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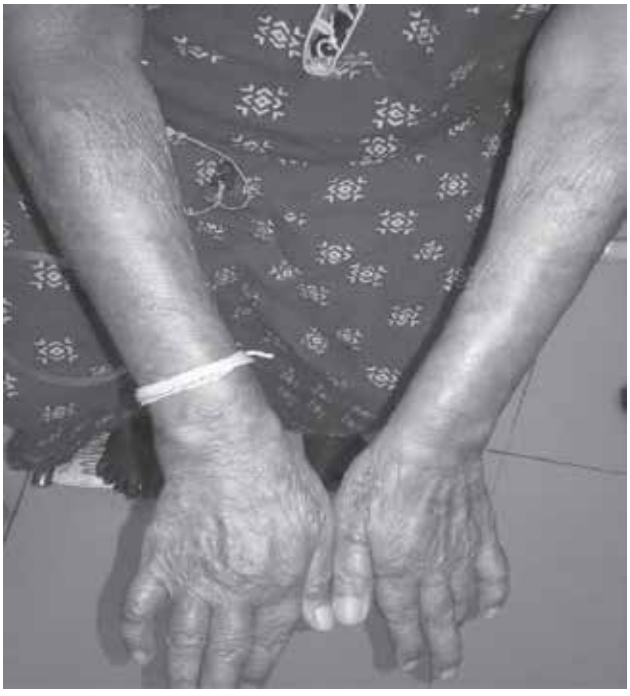

Figure 1. Multiple red-colored raised lesions (ENL) over body.

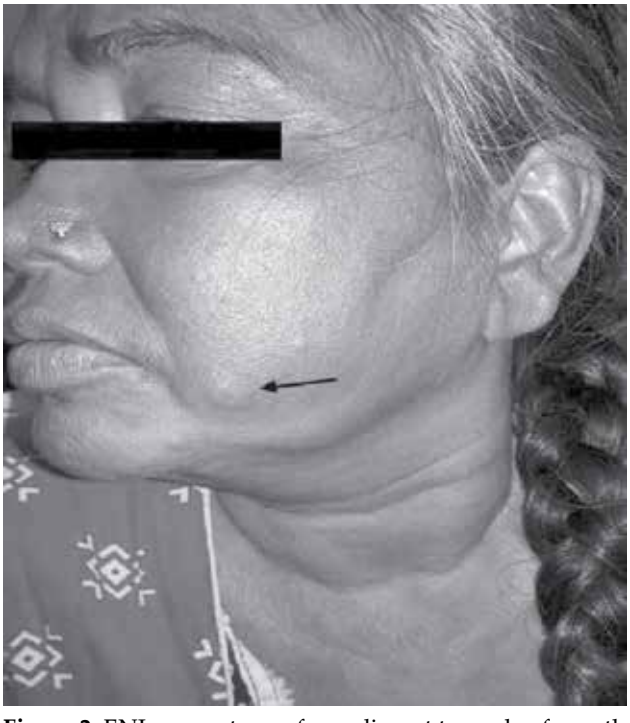

Figure 2. ENL present over face adjacent to angle of mouth (*arrow*).

agents on regular basis. She presented with fever, multiple red-colored raised lesions (Erythema nodosum leprosum or ENL) all over the body (Fig. 1), with weakness, tingling and numbness over both upper and lower limbs. ENL were also present over her face

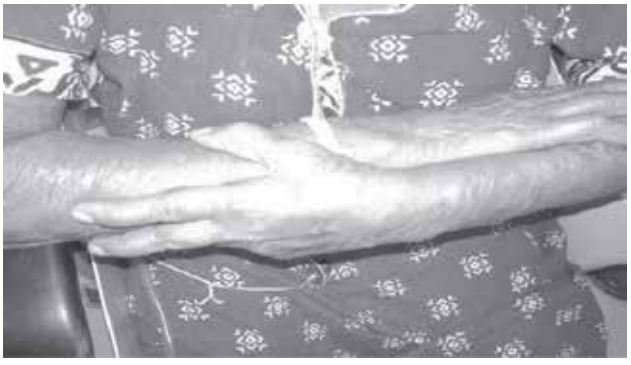

Figure 3. Xerosis and ichthyosis visible over bilateral upper limbs.

adjacent to the angle of mouth (Fig. 2). Xerosis and ichthyosis characteristic of leprosy was visible over bilateral upper limbs (Fig. 3). There was no history of photosensitivity or any drug intake or application of any local irritant prior to the initial lesion.

Her detailed central nervous system evaluation revealed upper motor neuron type of paraparesis, sensorimotor with proximal as well as distal muscle involvement with urge incontinence suggestive of spastic type of neurogenic bladder. Her mental functions were intact with no cranial nerve involvement. Cardiovascular system, respiratory system and per abdominal evaluation was within normal limits.

Her routine blood biochemistry was normal except for low hemoglobin levels (5.9%), raised white blood cell (WBC) counts (15,800) and raised random blood sugar (RBS) levels (157 mg/dL). Urine analysis revealed urinary tract infection for which she was treated with antibiotics. Bladder care was given. She was treated with baclofen. Skin examination revealed positive slit-skin smear for acid-fast bacilli with bacteriological index of 3.5 and skin biopsy consistent with lepromatous leprosy. She was put on oral steroids for type 2 lepra reaction and multibacillary anti-leprosy treatment for leprosy. Appropriate oral hypoglycemic agents were continued as she was reluctant with insulin administration. Brain imaging was normal. She responded well and her flexor spasms decreased. A psychiatric consultation was sought for her depression due to chronic illness and was started on antidepressants.

Discussion

Dominant or recessive genetic mutations give rise to a number of inherited neuropathies. The basic pathology happens to be in the Schwann cells, the myelinating unit of the neuron leading to defective myelination,

alteration of the axonal cytoskeleton and disruption of the axonal transport.[12] Genes involved in the axonal transport are the chief site of mutation in the majority of inherited neuropathies leading to the atrophy of the axons and directly correlate with the clinical features in the inherited neuropathies.[12] Diabetes mellitus is characterized by a number of sensorimotor and mixed neuropathies. The pathologic hallmark of neuropathies occurring in long-term diabetics involves the advanced glycation end products, persistent oxidative stress, polyol pathway flux and protein kinase C activation, ultimately contributing to microvascular disease and nerve dysfunction.[13]

Common symptoms of multiple sclerosis include sensory abnormalities including pain, motor symptoms due to involvement of the pyramidal tracts, visual disturbances, ataxia and Lhermitte sign. The pattern of abnormalities can vary from subtle limb weakness or sensory symptoms like Uhthoff phenomenon to more severe sensorimotor noncompressive myelopathies like acute transverse myelitis. Retrobulbar neuritis and optic neuritis have been the common causes of transient visual disturbances in multiple sclerosis. The onset is often polysymptomatic. Neuropathy is an early feature in Hansen's disease, as earliest diagnostic lesions are characterized by hypoesthesia.[14] Though early sensory loss is a common finding in leprosy, in some cases, patients can present with pain, which is often late in the course of the disease.[15,16]

In the tuberculoid spectrum of the Ridley-Jopling classification, neuropathy occurs in the proximity of the skin lesions, as against neuropathy in lepromatous disease, which is more generalized. Common nerves include the ulnar, median nerves (claw hand), the common peroneal nerve (foot drop), the posterior tibial nerve (claw toes and plantar insensitivity), the facial nerve (lagophthalmos), the radial cutaneous nerve, and the great auricular nerve. Subclinical neuropathy is found more commonly, as against it was previously believed in leprosy. These results may have implications for the design of ErbB2 RTK-based therapies for both leprosy nerve damage and other demyelinating neurodegenerative diseases.[17]

Here we report this case as to the best of our knowledge, leprosy with multiple sclerosis has not been reported in literature.

Conclusion

Multiple sclerosis, Hansen's disease and diabetes mellitus are multisystem diseases with distinct etiologies affecting the sensory as well as motor nerve fibers. It is considerably rare to find a demyelinating, infectious and autoimmune disease of the nerves to coexist in the same patient. All these conditions can be managed simultaneously and successfully.

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VIEWPOINT

Democracy in Diabetes Care: Acting Upon the Three A's – Accessibility, Affordability and Awareness

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ABSTRACT

Diabetes care is the right of every individual living with diabetes. In this communication, we describe the epidemiology of diabetes in India, draw parallels between democracy and diabetes, and call for the democratization of diabetes care. We highlight the three A's – Accessibility, Affordability and Awareness—that are essential for democratic diabetes care and share best practices towards this end.

Keywords: Diabetes, patient-centered care, person-centered care, type 1 diabetes, type 2 diabetes

Introduction

The prevalence of diabetes is out of control. Previously thought to be a disease of the affluent "Western" nations, type 2 diabetes has spread globally and is now a leading cause of disability and mortality, impacting even younger age groups. At least 537 million people live with diabetes across the globe, and this number is expected to rise to 783 million by 2045.[1]

To add to this, 3 in 4 people with diabetes live in low- and middle-income countries. In India, diabetes has risen from 7.1% in 2009 to 8.9% in 2019.[2] India ranks second with 74.2 million people living with diabetes, which is expected to rise to 124.9 million by 2045.[1] Of these, 53.1% are undiagnosed. India has the third-highest (0.6 million) annual deaths due to diabetes, after China and the United States.[1]

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A large community-based study in North India (STEPS survey) showed that out of 5,127 diabetes patients, 18%, 51% and 31% were in the age groups 18-24, 25-44 and 45-69 years, respectively; however, the prevalence of diabetes mellitus was found to be significantly higher among those aged 45-69 years (18.0%).[3] An increase in the prevalence of patients with diabetes (≥20 years) was reported in 2016 (7.7% [6.9-8.4]) compared to 1990 (5.5% [4.9-6.1]).[4]

According to several studies, the burden of diabetes is shared differently by genders due to various factors.[5] Studies in northern India show that women are more likely to develop diabetes, whereas those from southern India show that males are more likely to be diagnosed with diabetes.[6] Researchers have examined socioeconomic disparities in diabetes prevalence, but the gender disparity has not been investigated.[7] Few other studies have focused either on a single state or the geographical variation in the prevalence of diabetes in the country.[8]

The *India State-Level Disease Burden Initiative Diabetes* study reported the highest prevalence of diabetes in Tamil Nadu, followed by Kerala, Delhi, Punjab,

Goa and Karnataka.[4] Another study showed that states with higher per capita gross domestic product (GDP) and those belonging to higher socioeconomic status had more diabetes cases. This led to a clear epidemiological transition with a higher prevalence of diabetes in the low section of urban areas in the more economically developed states.[9]

According to the DIABetes study, the largest nationally representative epidemiological survey of India (data from 15 states/union territories), diabetes prevalence ranged from 3.5% to 8.7% and 5.8% to 15.5% in rural and urban areas, respectively, with the figure ranging from 4.3% in Bihar to 13.6% in Chandigarh.[10] This indicates that the prevalence of diabetes was higher in urban areas (11.2%) than in the rural areas (5.2%).[10]

The Response

Weak public health systems have been identified as a significant hindrance in providing quality diabetic care in low- and middle-income countries. Under the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), as part of the National Health Mission (NHM), Ministry of Health & Family Welfare, the Government of India focuses on strengthening infrastructure, equipment, human resource development, health promotion and awareness generation for prevention, early diagnosis, management and referral to an appropriate level of the health care facility for treatment of the noncommunicable diseases (NCDs).[10] Under NPCDCS, 682 district NCD clinics, 191 district cardiac care units and 5,408 community health center NCD clinics have been set up across India. A total of 7,04,631 Accredited Social Health Activists (ASHAs), 2,19,113 Auxiliary Nurse Midwife (ANM)/ Multipurpose Workers (MPW), 28,912 staff nurses, 76,567 Community Health Officers (CHOs) and 29,648 Medical Officers (MOs) have been trained on universal screening of common NCDs.[10] Besides the government infrastructure stated above, multiple private diabetes care set-ups, varying from small diabetes clinics to corporate hospitals and chains of diabetes care clinics are taking care of diabetes patients across the country.

The Result

Despite these resources, 3/4th of the Indian population (76.6%) had poor glycemic control (glycated hemoglobin [HbA1c] ≥7%), as reported by a large real-world study (n = 55,633 type 2 diabetes mellitus [T2DM] patients). In this study, one-third of the patients had microvascular complications.[11] To add to this, the ICMR-INDIAB study found that only 31% of persons with self-reported diabetes had an HbA1c below 7%. More than 60% of patients had not checked their HbA1c in the past year.[9]

The major challenges in achieving glycemic targets are clinical inertia, poor drug adherence and low disease awareness. Poor adherence can be because of the cost of the treatment, accessibility to health care or lack of awareness. Self-monitoring of blood glucose (SMBG) levels and enhancing medication adherence can contribute to meaningful improvements in HbA1c control.[12] Additionally, the quality of diabetes management in India varies considerably with physicians' awareness levels, attitudes and perceptions of diabetes care.[13]

The Right

In this scenario, we look towards our great Indian Constitution for guidance. It lays out every citizen's fundamental rights and duties. Although it does not explicitly define the "Right to Health", several references are made about public health that can serve as a beacon of hope toward universal health care. The Apex Court reaffirmed that every citizen of India has the right to health. Consequently, the "Right to Diabetes Care" is under this obligation and should be provided to every citizen, ensuring it is accorded affordably and appropriately.

Parallels can be drawn from the Constitution towards diabetes health care against the backdrop of the three values that the constitution assures its citizens – justice, equality and liberty. These can serve as the basis for driving a change around making diabetes care universal. Justice, in the diabetes care scenario, would imply offering the correct screening, diagnostic, monitoring and therapeutic tools to all those in need. Equality would mean that all people seeking health care be treated equally, without discrimination on any grounds. Liberty supports the right to freedom in patient-centered care (PCC) and patient autonomy. PCC is "providing respectful care and responsiveness to individual patient preferences, needs and values and ensuring that patient values guide all clinical decisions."

Every citizen of India must be accorded the right to euglycemia. It is not just the biochemical parameters but a holistic approach. It is about creating an environment conducive to promoting euglycemia by encouraging

appropriate individual and community lifestyle and diet changes. It is paramount that the model is sustainable, self-sufficient, universal and patient-centric.

The Three A's

Utilizing the principles behind the three values as enshrined in our constitution, we should aim towards the right to euglycemia, following a path built on the 3A's – Accessibility, Affordability and Awareness. These would ensure that each citizen of India is provided with genuine quality diabetes care irrespective of economic stature, social standing, educational background, age, gender, etc.

Accessibility

Accessibility to diabetes care is hampered because of the high patient-to-provider ratio and geographical location, particularly in rural areas where people have to travel several hours to get their investigations done or consult a specialist. Management of T2DM in low- and middle-income settings is suboptimal due to less access to medications, comorbidities and the growing population of patients, which is responsible for the overuse of existing resources.[14] There are often delays in diagnosis, creating a greater burden for patients with complications.[15]

Digital Health Solutions in the form of blood glucose tracking Apps can be an answer to some of these issues and can shape the future of diabetes care in the country. One such tool is BeatO, which is committed to creating a digital health care ecosystem, and which can be accessed by all on their smart phones. It aims at increasing awareness and bringing behavioral changes by delivering personalized, actionable insights, reminders, caregiver alerts, diabetes educator support and guidance, educational content, doctor consultation and doorstep medicine delivery. As of today, it is already serving over 5 lakh diabetes patients across the country.[16] It has been instrumental in providing an ecosystem and delivering outcomes for the monitoring population and has been responsible for expanding the diabetes care landscape. Around 70% of its members are from tier 2 cities and beyond, 55% of members using this monitoring device are first-time glucometer users, and 83% of members have had their first interaction with a diabetes educator or coach on this platform. The depth and relevance of engagement have increased the time spent on the app—on average; a member spends approximately 10 minutes and 5 seconds daily on the platform.[16]

Affordability

Considering the high cost incurred at various steps of screening, diagnosis, monitoring and management, it is necessary to implement cost-effective measures for diabetes care. A systematic review on the costs of diabetes treatment in low- and middle-income countries reported that diabetes care is costly as many people have no health insurance and have to pay from their pocket.[17] In India, the average cost of outpatient diabetes care is about Rs. 11,000 per annum.[18] This poses a tremendous financial burden on the family, and there is a need to find ways to make diabetes care more affordable for the masses. Various studies have shown that low adherence to the medication is responsible for up to 50% of treatment failures, leading to complications. In the lower-income group, the cost of medication is a major reason for the poor adherence to antidiabetic medications.[19]

Digital technology that gives easy access to quality health care facilities will reduce the cost of diabetes care and improve patient outcomes. BeatO, for instance, has provided the right affordable tools (glucometer and strips) and free mobile application for the diabetes population, which has aided in lifting the financial burden by empowering the members to monitor more frequently in the last 5 years, thus driving better outcomes and lowering the cost for management over time.

Awareness

In a countrywide National NCD Monitoring Survey on Prevalence, Awareness, Treatment and Control of Diabetes in India, only 45.8% of patients were aware of their disease. Even among people who have been diagnosed with diabetes, only 40.6% were aware that diabetes could damage their vital organs. In another general population study, less than 30% of subjects knew about complications related to kidneys, eyes and nerves.[20]

Mobile health interventions help to improve diabetes risk behaviors and increase awareness about diabetes and its complications, etiology and manifestations. In the mDiabetes program implemented by Arogya World, there was an 11% increase in daily exercise, a 15% increase in the intake of 2 to 3 servings of fruits a day, and an 8% increase in 2 to 3 servings of vegetables per day by just text messages.[21]

Resolution

To make India the Diabetes Care Capital of the World, we can take the help of the philosophy of Gandhi Ji's

"Sarvodaya through Antyodaya", which means the development of all through the welfare of the weakest section of society.[22] A comprehensive, structured diabetes care program designed to provide holistic care to people living with diabetes will help ensure the democratization of diabetes care in India and beyond.

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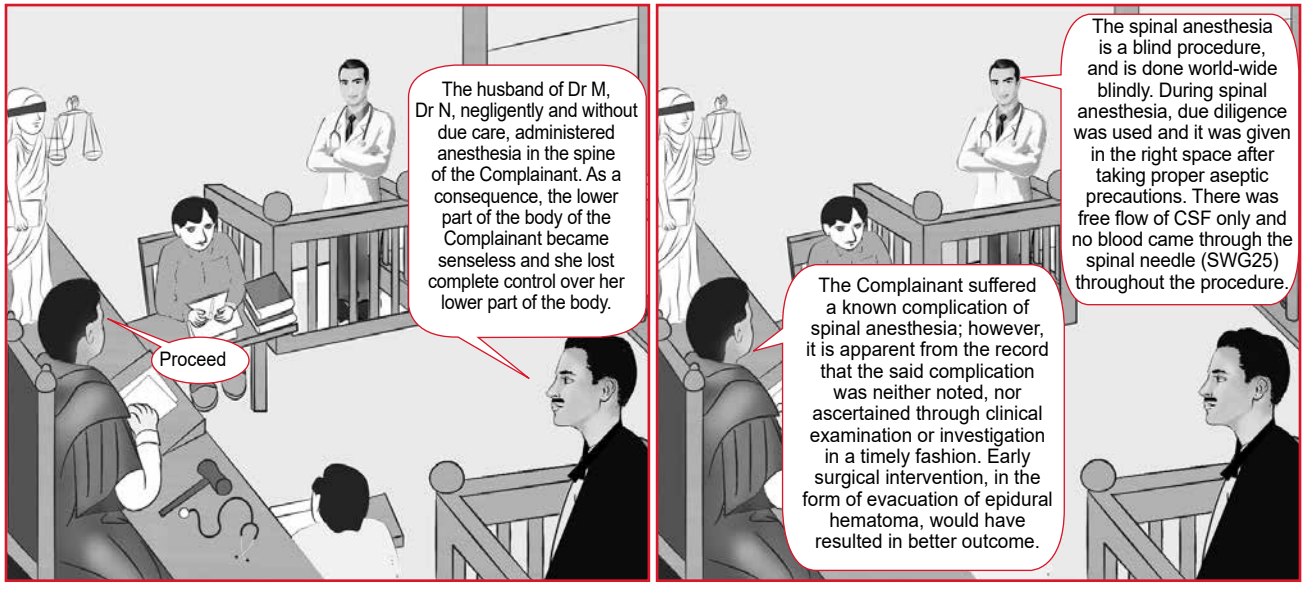
Failure to Timely Diagnose and Intervene in a Known Complication of a Procedure



Lesson: The Disciplinary Committee of the Delhi Medical Council (DMC) found that the Respondents failed to exercise reasonable degree of skill, knowledge and care, in the treatment administered to the Complainant, which was expected of an ordinary prudent doctor and recommended that names of the Respondents be removed from the State Medical Register of the DMC for a period of 15 days.

Course of Events

28.11.2008: The Complainant was admitted for delivery in Nursing Home A under Dr M, as she had been under her care during prenatal period. The Complainant was rushed into the operation theater on 28th November, 2008 in hurry by creating panic situation stating that the baby had passed stools.

Allegations of Complainant

In the operation theater, the husband of Dr M, Dr N, who is posted in a Government Hospital, negligently and without due care, administered anesthesia in the spine of the Complainant. As a consequence, the lower part of the body of the Complainant became senseless and she lost complete control over her lower part of the body.

The baby was delivered but the Complainant could not recover from the ailment caused to her on account of professional negligence on the part of Dr M and Dr N.

The Complainant was constrained to consult various experts to get herself examined and magnetic resonance imaging (MRI) report clearly shows that the anesthesia was wrongly administered leading to the said ailment, which completely immobilized the Complainant and she has been confined to bed for almost 2½ years. It was further alleged by the Complainant that Dr N is employed with Government Hospital and has been carrying out the private practice in unauthorized and illegal manner. The Respondents did not render any medical help to the Complainant after she developed the above said problem on account of negligence on the part of the Respondents.

The Respondents did not disclose/inform the Complainant or her relatives regarding the nature of the ailment, which afflicted the Complainant after administration of said anesthesia. The Respondents have neglected the Complainant and willfully committed an act of negligence, which has led to immobilization of the Complainant.

Rejoinder of Respondents

Dr M, the Respondent stated that an absolute emergency and life-threatening condition for the Complainant had developed as the membranes had ruptured spontaneously and fetus had passed the stool (meconium) inside. There was immediate threat to the baby aspirating the meconium-stained liquor in mouth and lungs, which could have been fatal for the baby.

The anesthetist on the call was contacted telephonically and since he was busy in another operation and would be available after approximately 2 hours, another anesthetist was contacted but his mobile did not connect after repeated attempts.

It was only after failure to contact the anesthetist despite repeated attempts that Dr N was contacted in this emergency situation. On being apprised of the emergency situation and the danger to the baby, Dr N agreed with great reluctance only on moral and humanitarian grounds in the best interest of both, the Complainant and her to be born baby.

Dr N, the Respondent stated that the spinal anesthesia was given after taking due care and attention. During spinal anesthesia, due diligence was used and it was given in the right space after taking proper aseptic precautions. There was free flow of cerebrospinal fluid (CSF) only and no blood came through the spinal needle (SWG25) throughout the procedure. As for the loss of control over the lower part of the body is concerned, it is an unfortunate and an isolated incident for which they cannot be blamed.

The Respondents arranged for the urgent and immediate MRI themselves, as soon as they noticed the complication. The MRI scan showed epidural hematoma and spina bifida. The spina bifida is a congenital anatomical defect about which the Complainant did not tell them. The presence of such defect in the spine cannot be ascertained beforehand, before giving spinal anesthesia especially in pregnant women or before starting surgery. They cannot be blamed for such congenital defect in the spine.

MRI report also does not mention about any neurological damage committed during the anesthesia procedure. The epidural hematoma in the MRI scan could not be due to the abnormal arterial venous plexus/ arteriovenous malformations present in the epidural space. The spinal anesthesia is a blind procedure, and is done world-wide blindly.

Observations of DMC

The spinal anesthesia is a blind procedure. The Complainant suffered a known complication of spinal anesthesia; however, it is apparent from the record that the said complication was neither noted, nor ascertained through clinical examination or investigation in a timely fashion. The Complainant was administered spinal anesthesia for purposes of delivery on 28th November, 2008. Postoperatively, the Complainant lost complete control over her lower part of the body and complained of acute pain in the spinal region which was attributed to normal pain associated with the procedure and was managed by administering injection voveran, a painkiller.

As per literature, maximum chances of recovery in epidural hematoma (post spinal anesthesia) are within first 8 to 10 hours of injury, a time period which had already elapsed prior to her neurological consultation. It was only on 29th November, 2008 in the morning that the spinal complication was noted and neurological consultation was sought.

The treating team failed to assess the gravity of the clinical condition of the Complainant. When the Complainant was diagnosed as having neurological deficit on 29th morning, it would have been desirable to get an urgent MRI, which would have assisted in confirming the diagnosis and prompted an early surgical intervention in the form of evacuation of epidural hematoma, which would have resulted in better outcome.

As regards, the conduct of Dr N of indulging in private practice, in spite of being in Government service needs to be looked into by the Government.

Order of DMC

In light of the observation made hereinabove, it was the decision of the Disciplinary Committee that the treating team of Dr M and Dr N failed to exercise reasonable degree of skill, knowledge and care in the treatment administered to the Complainant, which was expected of an ordinary prudent doctor. The Disciplinary Committee, therefore, recommended that names of Dr M and Dr N be removed from the State Medical Register of the DMC for a period of 15 days.

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■■■■

News and Views

Smartphone-linked Artificial Pancreases Developed by IISc to Monitor Blood Sugar Level

A research team from IISc, Bengaluru, in collaboration with doctors from MS Ramaiah Medical College, has developed an artificial pancreas system. This can monitor and control blood sugar levels in real-time to help people with type 1 diabetes who need to take insulin regularly to avoid low blood sugar (hypoglycemia) or high blood sugar (hyperglycemia).

The Artificial Pancreas (AP) setup developed by Dr Radha Kant Padhi, Professor in the Department of Aerospace Engineering and Robert Bosch Centre for Cyber-Physical Systems, mimics the body's closed loop system that regulates insulin production. The setup has three parts, namely a sensor, an insulin pump and an Android app.

The sensor is a small coin-like device with a tiny needle-like extension that is stuck to the skin like a patch or band-aid that will monitor the glucose concentration in the subcutaneous tissue continuously. The sensor is connected to an insulin pump that will infuse insulin under the skin. The pump is a small rectangular device that can be carried around in a pocket. Both the sensor and the pump are connected to the android app. The app analyses the data sent by the sensor and determines how much insulin should be pumped into the body through the insulin pump. The key component of the app is the Model Predictive Control (MPC). This predicts how much insulin is required based on the sensor's data and sends the signal to the insulin pump. This predictive nature makes MPC a good algorithm for the AP system since blood glucose levels of type 1 patients need to be continuously regulated.

(*Source: https://health.economictimes.indiatimes.com/news/medical-devices/bengaluru-iisc-develops-smartphone-linked-artificial-pancreas-to-monitor-blood-sugar-levels/94673859*)

Risk of Obesity in Kids is Increased by the Intake of Ultra-Processed Food by Mothers

A recent study published in the *BMJ* revealed that a mother's use of ultra-processed foods was connected to an elevated risk of being overweight or obese in her kids, regardless of other lifestyle risk factors. According to the World Health Organization (WHO), 39 million children were overweight or obese in 2020, leading to increased risks of heart disease, diabetes, cancer and early death. The study suggested that mothers may benefit from limiting their intake of ultra-processed foods. The researchers also suggested that the dietary guidelines should be refined, including the removal of financial and social barriers to improve nutrition for women of childbearing age and to reduce childhood obesity. In the study, the researchers used data from the Nurses' Health Study II (NHS II) and the Growing Up Today Study (GUTS) I and II. The researchers also considered a range of other potentially influential factors, such as the mother's weight (body mass index [BMI]), physical activity, smoking, living status and partner's education, as well as children's ultra-processed food consumption, physical activity and sedentary time.

Based on the analysis, the study results showed that a mother's ultra-processed food consumption was associated with an increased risk of obesity or being overweight in her offspring. For example, a 26% higher risk was seen in the group with the highest maternal ultra-processed food consumption (12.1 servings/day) in comparison to the lowest consumption group (3.4 servings/day). It also found that prenatal ultra-processed food intake had no significant association with an increased risk of offspring being overweight or obese.

(*Source: https://theprint.in/features/study-mothers-intake-of-ultra-processed-food-associated-with-risk-of-obesity-in-kids/1156511/*)

New 3D Technique Developed to Treat Diabetic Foot Ulcers

Researchers at Queen's University Belfast have created a new cost-effective bandage therapy called a scaffold to treat diabetic foot ulcers, which provides better patient outcomes. The scaffolds, which are created by 3D bioprinting, gradually release antibiotics over a 4-week period to cure the wound. The study was published in *The Journal of Drug Delivery and Translational Research*.

The scaffold structure, according to experts, is a unique carrier for cell and medication transport that improves wound healing. By using these scaffolds, which function like windows, surgeons can continuously monitor the healing process without having to remove them, as frequent interference for changing the dressing increases the risk of infection and slows down the healing process. "The 'frame' contains an antibiotic that kills the bacterial infection, and the 'glass', is made

of collagen and sodium alginate, which might include a growth factor that promotes cell growth. The scaffold has two molecular levels, each of which is crucial to the healing of the wound." This new development has been shown to enhance the quality of life among patients and decrease the cost of treatment and also the clinical burden in diabetic foot ulcer treatment.

(*Source: https://m.dailyhunt.in/news/india/english/ani67917250816496966-epaper-anieng/new+3d+technique+developed+by+researchers+to+revolutionise+diabetes+treatment-newsid-n429702646?listname=topicsList&topic=health%20fitness&index=2&topicIndex=8&mode=pwa&action=click*)

Risk of Adverse Outcomes Increased by Long-term Antidepressant Use

Long-term antidepressant usage has been associated with an increased risk of adverse effects, including cardiovascular disease (CVD), cerebrovascular disease (CV), coronary heart disease (CHD) and all-cause mortality, according to a study published in the *British Journal of Psychiatry Open*.

The study involved 2,22,121 participants whose information was connected to primary care records in 2018. They found that 10-year antidepressant usage was linked to an almost twofold increased risk of CVD and CVD mortality, a nearly twofold high risk of CHD, a greater chance of CV and an almost twofold increased risk of all-cause mortality. At 5 years, selective serotonin reuptake inhibitors (SSRIs) were linked to a lower risk of developing diabetes. At 10 years, SSRIs were linked to a higher risk of CV, CVD and all-cause mortality, a lower risk of diabetes and hypertension, and a higher risk of CHD, CVD and all-cause mortality when compared to non-SSRIs. Mirtazapine, venlafaxine, duloxetine and trazodone caused more adverse effects; however, SSRIs were also associated with an elevated risk. The studies highlight the importance of proactive cardiovascular monitoring and prevention in patients with depression taking antidepressants, as both have been linked to greater risks.

(*Source: https://www.medscape.com/viewarticle/981951#vp_3*)

India Diabetes Study: High BMI Linked to Raised Risk of CVDs

India Diabetes Study (IDS) has reported that more than 55% of newly diagnosed type 2 diabetes mellitus (T2DM) patients in India have low high-density lipoprotein cholesterol (HDL-C) values, suggesting that they are at higher risk of developing some form of CVD in their lifetime. The study also said that 42% of all T2DM patients are at a higher risk of hypertension. As per the Indian Consensus Group guidelines, the mean body mass index (BMI) of the patients was recorded to be 27.2. The study published in the *PLOS* journal was supported by Eris Lifesciences and co-authored by 16 doctors during the period 2020-2021. It was conducted with the involvement of more than 1,900 physicians and had a sample size of 5,080 patients with a mean age of 48 years, from 27 states across the country.

Dr AG Unnikrishnan said, *"India Diabetes Study focused on highlighting the cardiovascular risk factors in newly diagnosed diabetes patients across India. While treatment should focus on dietary changes, physical activity and glucose control, additionally addressing cardiovascular risk by strategies like a blood pressure control and lipid management offer a more holistic way of management- as also suggested in the India Diabetes Study."*

The study also reported that 92.5% and 83.5% of the total patients did not receive any cholesterol-lowering and antihypertension treatment. Low HDL-C was reported as the most frequent major risk while 82.5% of patients seemed to have at least one cholesterol-related abnormality.

(Source: ET HealthWorld, April 8, 2022)

Treatment of Mild Hypertension During Pregnancy is Safe and Effective

There were fewer adverse pregnancy outcomes when pregnant women with mild chronic hypertension were treated with an antihypertensive medication before or during the first 20 weeks of pregnancy in the Chronic Hypertension and Pregnancy (CHAP) trial published in the *New England Journal of Medicine*.[1]

A total of 2,408 pregnant women with mild hypertension were enrolled in this multicenter trial, from 2015 to 2021. Of these, 1208 participants were assigned to treatment with antihypertensive medication to keep their blood pressure (BP) below 140/90 mmHg (intervention group); the remaining 1,200 received an antihypertensive only when the BP increased to 160/105 mmHg and higher (control group). They were followed through delivery and for 6 weeks after delivery.

Results showed that treatment of hypertension to keep the BP below 140/90 mmHg reduced the odds of preterm birth or other pregnancy-related complications. About 70% of women did not have any negative pregnancy outcomes, while 30% developed pre-eclampsia, placental abruption, preterm birth (<35 weeks) or intrauterine or neonatal death. About 37%

of the participants in the control group experienced a similar adverse event.

The antihypertensive treatment had no adverse impact on fetal growth as the birth weight of infants was comparable between the two groups. Most of them had normal birth weight; 11% of babies born to participants who received medication and 10% of babies born to those in the control group had impaired fetal growth.

This study from the National Institutes of Health (NIH) shows that hypertension in pregnancy can be safely and effectively treated. Giving antihypertensive therapy to keep BP below 140/90 mmHg in pregnant women with mild chronic hypertension is a feasible strategy rather than waiting to start treatment when hypertension increases to severe levels, according to the study.

Reference

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A Low-salt Diet Improves the Quality of Life in Heart Failure Patients

A recent study published in *The Lancet* reported that while low-sodium diets help in improving the quality of life for people with heart failure, they did not reduce clinical events such as hospitalization or emergency room visits.

Researchers in the study reported that reducing sodium intake in the diet can benefit people with heart failure. However, adverse clinical outcomes such as hospitalization do not get affected by the reduction of sodium in diet. In the study, participants were randomly placed into two groups, the intervention group with a low-sodium diet (<1,500 mg of sodium daily) and the control group receiving the standard of care of the region they were located in.

The results showed that the hospitalizations, emergency room visits, and all causes of death were not reduced for participants in the low-sodium diet group compared to the control group. However, a moderate benefit on quality of life and in the New York Heart Association (NYHA) scale classification in the intervention group was seen.

The study results were summarized by Dr Paz as, "*Following a low-salt diet did not reduce death or trips to the hospital in people with congestive heart failure. Despite this fact, there still was a signal for benefit in some key endpoints favoring a low-salt diet, including functional assessments.*" (*Do low salt diets improve outcomes in heart failure? [medicalnewstoday.com)]*)

Healthy Plant-based Diet and the Risk of Type 2 Diabetes

Eating healthy plant-based foods reduces the risk of developing type 2 diabetes compared to those who consumed a diet rich in unhealthy plant-based foods. And, those who ate a healthy plant-based diet also had a different metabolic profile, suggests a recent study published in the journal *Diabetologia*.[1]

Researchers from the US evaluated the dietary patterns of 8,827 participants from the Nurses' Health Study, Nurses' Health Study II and Health Professionals Follow-up Study using semi-quantitative food frequency questionnaires. Three plant-based diets were examined and based on the answers, three indices were developed namely overall Plant-based Diet Index (PDI), a Healthy Plant-based Diet Index (hPDI) and an Unhealthy Plant-based Diet Index (uPDI), which were used to evaluate their adherence to plant-based diet. The mean age of the study subjects was 54 years and the mean BMI was 25.6 kg/m^2.

The *healthy plant-based* diet included whole grains, fruits, vegetables, nuts, legumes, vegetable oil, tea and coffee. The *unhealthy plant-based* diet included refined grains, fruit juices, potatoes, sugar-sweetened beverages and sweets and desserts, while the *animal-based* diet included animal fats, dairy, eggs, fish, meat and other animal-based products.

The plant metabolites were measured to develop metabolite profile scores for the participants and their association with the risk of incident type 2 diabetes was examined. Fifty-five metabolites were found to correlate with an overall plant-based diet, 93 metabolites with a healthy plant-based diet and 75 metabolites with an unhealthy plant-based diet.

Analysis of different metabolites revealed a difference between the healthy and unhealthy plant-based diets and the risk of type 2 diabetes. Participants with high PDI and hPDI scores were at a lower risk of type 2 diabetes with an adjusted hazard ratio of 0.83 and 0.8, respectively.

Gamma-aminobutyric acid, C5-carnitine and three triacylglycerol metabolites were associated with lower PDI score and consequently a higher risk for type 2 diabetes. On the other hand, an inverse association

was noted between isoleucine, C22:0 ceramide and six triacylglycerol metabolites and a hPDI and therefore an increased risk of type 2 diabetes.

Metabolites such as trigonelline, betaine and glycine showed an association with higher PDI score and lower risk for type 2 diabetes. Likewise, trigonelline, hippurate and C22:6 ceramide were associated with a higher hPDI score and a lower risk for type 2 diabetes.

This study recapitulates the beneficial role of plant-based diets, especially a healthy plant-based diet on the risk of type 2 diabetes as well as in the management of type 2 diabetes in achieving glycemic control. A healthy plant-based diet is also heart-friendly. This study has also shown a correlation between the plant metabolites and risk of type 2 diabetes, which warrants further investigation to validate their role in the risk of developing type 2 diabetes. "The metabolite profiles we identified could be used to assess the adherence and metabolic response to plant-based diets during dietary interventions", suggest the authors.[2]

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CRP: A Potential Biomarker to Predict Risk of Delirium in Stroke Patients

Acute stroke patients with high C-reactive protein (CRP) levels >7.09 mg/L are at greater risk for developing delirium, suggests a study from Poland published in the journal *Acta Psychiatrica Scandinavica*.[1]

For this study, researchers retrospectively analyzed data from 459 patients who had been hospitalized for acute stroke or transient ischemic attack (TIA) within 24 hours with the aim to find out if including CRP with other clinical factors (Models A and B) could enhance prediction of delirium in these patients.

The factors in Model A were age and stroke severity, while in Model B, severity of stroke, diabetes, atrial fibrillation, pre-stroke dependency and hemorrhagic stroke were the factors included. They were a part of the PRospective Observational POLIsh Study on delirium (PROPOLIS), which was an observational, prospective single-center study and had recruited patients with ischemic stroke, TIA or intracerebral hemorrhage from May 2014 to March 2016, within 48 hours of symptoms. Patients who had CRP measured at baseline were enrolled for this study. Their median age was 73 years and more than half (52.7%) the study population was comprised of women. Patients were evaluated for neurological deficits (National Institutes of Health Stroke Scale [NIHSS]), cognitive decline, pre-stroke dependency (modified Rankin Scale) and delirium (Brief Confusion Assessment Method for verbal patients and the Confusion Assessment Method for the Intensive Care Unit for nonverbal patients).

Nearly one-third (29.2%) of patients developed delirium with 46.2% experiencing mixed delirium, 39.2% hypoactive delirium and 14.2% hyperactive delirium. The delirious patients also had higher levels (median) of CRP than those who did not have delirium; 13.2 mg/L vs. 4.4 mg/L, respectively.

A cut-off level of 7.09 mg/L was identified as marking the distinction between the two groups. On univariate analysis, CRP and other clinical factors such as age, diabetes, atrial fibrillation, pre-stroke dependency, pre-stroke cognitive decline, NIHSS score on admission. Hemorrhagic stroke were associated with increased risk for delirium. But on multivariate analysis, this association remained significant only for CRP. The risk was threefolds higher in patients with CRP levels >7.09 mg/L with an adjusted odds ratio (aOR) of 2.98. The researchers also noted that addition of CRP to the two clinical models examined, the "area under receiver operator curve increased from 0.77 to 0.80 for Model A and from 0.81 to 0.84 for Model B."

Delirium in stroke patients is indicative of a poor clinical outcome. Identification of a factor that could predict development of delirium enables monitoring of at-risk patients and timely implementation of appropriate management strategies. CRP, a marker of systemic inflammation, is a commonly performed test in clinical practice. Based on their findings, the authors suggest CRP as a potential marker for risk of delirium in post-stroke patients. Acute stroke patients with high CRP levels, above the cut-off level defined in this study, should be closely monitored for delirium.

Reference

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LETTER TO EDITOR

Affordable Technology and Diabetes Care

AMIT BAKSHI*

**Eris Lifesciences, Ahmedabad, India*

Technology has become an indispensable part of modern diabetes care.[1]

Newer advances have helped improve the screening and diagnosis of diabetes, its complications, as well as monitor the treatment of syndrome. Affordability, however, remains a stumbling block in the universal adoption of technology tools.

Most of us are aware of the concept of monopoly, which alludes to the power held by a single supplier of goods or services. An opposite concept, that of monopsony, i.e., being a single (or larger) buyer,[2] can be utilized to procure medical devices at an economical rate.

This methodology has been used in our Patient Care Initiatives (PCI)[3] to provide diagnostic and monitoring devices to large numbers of persons living with diabetes and/or cardiovascular disease, through their physicians. Table 1 lists the various tools and techniques that we offer, and their reach across India.

Technology, however, does not work if it is not accompanied by trained manpower.[4] We ensure that our field staff is educated and experienced in the effective and efficient usage of the modalities being offered to patients.

Biomedical training, too is insufficient unless it is associated with empathy[5] and sympathy for fellow human beings. We strive to achieve the highest standards of services by sensitizing our health care professionals and providers towards these ideals.

As India strives to achieve a diabetes complication-free status, and be recognized as the diabetes care capital of the world,[6] we feel privileged to play our part in this endeavor. We welcome public-private and private partnerships which will help enhance the reach of our PCI, and improve the quality of diabetes care in India.

Table 1. Patient Care Initiatives in Diabetes Care

- Related to screening and diagnosis
  - Glucometry
  - Point of care glycated hemoglobin (HbA1c)
- Related to monitoring
  - Ambulatory glucose monitoring (AGM)
  - Continuous glucose monitoring (CGM)
- Related to microvascular complication screening
  - Foot inspection with refractory mirror
  - Neuro touch device for neuropathy
  - Fundus camera
- Related to macrovascular complication screening
  - Ambulatory blood pressure monitoring (ABPM)
  - ECG monitoring
  - Holter
  - Sleep study
- Related to management
  - Carb canvas (carbohydrate counting app)
  - Insulin pens
  - Insulin pumps

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Lighter Side of Medicine

HUMOR

NO + NO = Yes

In a mathematics class the teacher told the student that minus * (times) minus –*– = + and also NO + NO = Yes. So, a boy was pressed to go to toilet. He then asked the teacher, "Excuse me, sir, can I use the toilet?" The teacher said, "No." The student asked again, "Excuse me, sir, can I use the toilet?" The teacher said, "NO."

Immediately student stood up to go to the toilet, the teacher was surprised and said, "Where are you going?" He said, "Toilet." The teacher asked him, "Why?" He said, "NO + NO = Yes, so since you said NO two times I know you mean Yes." So, the class burst into laughter.

Flustered

As an instructor in driver education at the local area High School, I've learned that even the brightest students can become flustered behind the wheel. One day I had three beginners in the car, each scheduled to drive for 30 minutes. When the first student had completed his time, I asked him to change places with one of the others. Gripping the wheel tightly and staring straight ahead, he asked in a shaky voice, "Should I stop the car first?"

Bank Name

Mother decided that 10-year-old Cathy should get something 'practical' for her birthday. "Suppose we open a savings account for you?" mother suggested.

Cathy was delighted. "It's your account, darling," mother said as they arrived at the bank, "so you fill out the application."

Cathy was doing fine until she came to the space for "Name of your former bank." After a slight hesitation, she put down 'Piggy.'

I Get the Circle Around It

Tech support: How may I help you?

Customer: I'm writing my first e-mail.

Tech support: OK, and what seems to be the problem?

Customer: Well, I have the letter 'a' in the address, but how do I get the circle around it?

Bribery

A baseball club is among the features of a boys' organization connected with a prominent church. The team was challenged by a rival club. The pastor gave a special contribution of five dollars to the captain, and stated that the money should be used to buy bats, balls, gloves, or anything else that might help to win the game. On the day of the game, the pastor was surprised to see that nothing new could be seen in the club's paraphernalia. He called the captain.

"I don't see any new bats, or balls, or gloves," he said.

"We haven't anything like that," the captain admitted.

"But I gave you five dollars to buy them," the pastor exclaimed.

"Well, you see, you told us to spend it for bats, or balls, or gloves, or anything that we thought might help to win the game, so we gave it to the umpire."

Dr. Good and Dr. Bad

SITUATION: A type 2 diabetic patient had uncontrolled blood glucose levels. He was worried if this could affect his heart.

LESSON: An independent association has been established between uncontrolled blood glucose levels and subclinical LV dysfunction. This may increase systolic and diastolic energy loss in LV. The researchers have shown that LV systolic energy loss may help in predicting preclinical LV dysfunction for diabetic patients with uncontrolled blood glucose levels.

Int J Cardiovasc Imaging. 2017;33(8):1151-8.

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