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Men's Health Index: A Pragmatic Approach to Stratifying and Optimizing Men's Health

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Purpose: The proposed Men's Health Index (MHI) aims to provide a practical and systematic framework for comprehensively assessing and stratifying older men with the intention of optimising their health and functional status.

Materials and Methods: A literature search was conducted using PubMed from 1980 to 2012. We specifically looked for instruments which: assess men's health, frailty and fitness; predict life expectancy, mortality and morbidities. The instruments were assessed by the researchers who then agreed on the tools to be included in the MHI. When there was disagreements, the researchers discussed and reached a consensus guided by the principle that the MHI could be used in the primary care setting targetting men aged 55-65 years.

Results: The instruments chosen include the Charlson's Combined Comorbidity-Age Index; the International Index of Erectile Function-5; the International Prostate Symptom Score; the Androgen Deficiency in Aging Male; the Survey of Health, Ageing and Retirement in Europe Frailty Instrument; the Sitting-Rising Test; the Senior Fitness Test; the Fitness Assessment Score; and the Depression Anxiety Stress Scale-21. A pilot test on eight men was carried out and showed that the men's health index is viable.

Conclusions: The concept of assessing, stratifying, and optimizing men's health should be incorporated into routine health care, and this can be implemented by using the MHI. This index is particularly useful to primary care physicians who are in a strategic position to engage men at the peri-retirement age in a conversation about their life goals based on their current and predicted health status.

Keywords: Health status indicators; Men; Physical fitness; Retirement

INTRODUCTION

Globally, a clinical approach to assessing and managing men's health is lacking. This is despite the fact that men have a shorter life expectancy and poorer health than do women. In Europe, working age men have significantly higher mortality rates than do working age women (210% higher mortality rate in the 15- to 64-year-old age range; 630,000 men per year versus 300,000 women) [1].

Health promotion, screening, and active surveillance of illnesses with timely intervention are effective in optimizing health and retarding disease progression. A more gender-specific and age-specific approach to assessing, stratifying, and improving men's health is necessary. This is particularly relevant to men who are reaching retirement age, at time at which men are at a crossroads in deciding

the next phase of their lives. Their health status determines how they spend the rest of their lives.

Currently, generic tools are available that can predict mortality and morbidity, functional status, and optimal health. However, these tools have limitations. They often focus on only one domain and do not provide a more comprehensive assessment of men's overall health status. Having a strategy that incorporates these tools to prognosticate men's health will guide men in making decisions about and planning for their life. The proposed Men's Health Index (MHI) aims to provide a practical and systematic framework for assessing and stratifying older men with the intention of optimizing their health and functional status.

MATERIALS AND METHODS

The MHI was developed on the basis of literature review and expert consensus. The research team consisted of two consultant urologists, one family physician with a PhD, and two other PhD holders. The team members reviewed the literature (described below) and identified tools that are used to prognosticate men's health outcomes, including mortality, cardiovascular mortality, frailty, functional status, and fitness. The team brainstormed and developed

the MHI framework through an iterative process. When there was disagreement, the researchers discussed and reached a consensus based on the aim of developing a practical framework for clinicians to use in daily practice. Several revisions were made before finalization.

We conducted a literature search by using PubMed from 1980 to 2012. We specifically looked for instruments that are used to assess men's health, frailty, and fitness and to predict life expectancy, mortality, and morbidities. Only articles in English were included. The following medical subject heading terms were used: "men's health," "frailty," "fitness," "life expectancy," and "comorbidities and "questionnaires" or "instruments." Inclusion criteria for article selection were those instruments that are easy to use in a primary care setting. The questionnaires and instruments were assessed by the researchers who then agreed on the tools to be included in the MHI. When there was disagreement, the researchers discussed and reached a consensus guided by the principle that the MHI could be used in the primary care setting targeting men aged 55 to 65 years.

This was not a systemic review but a framework of tools and questionnaires that were selected on the basis of expert consensus to assess men's health. This framework will
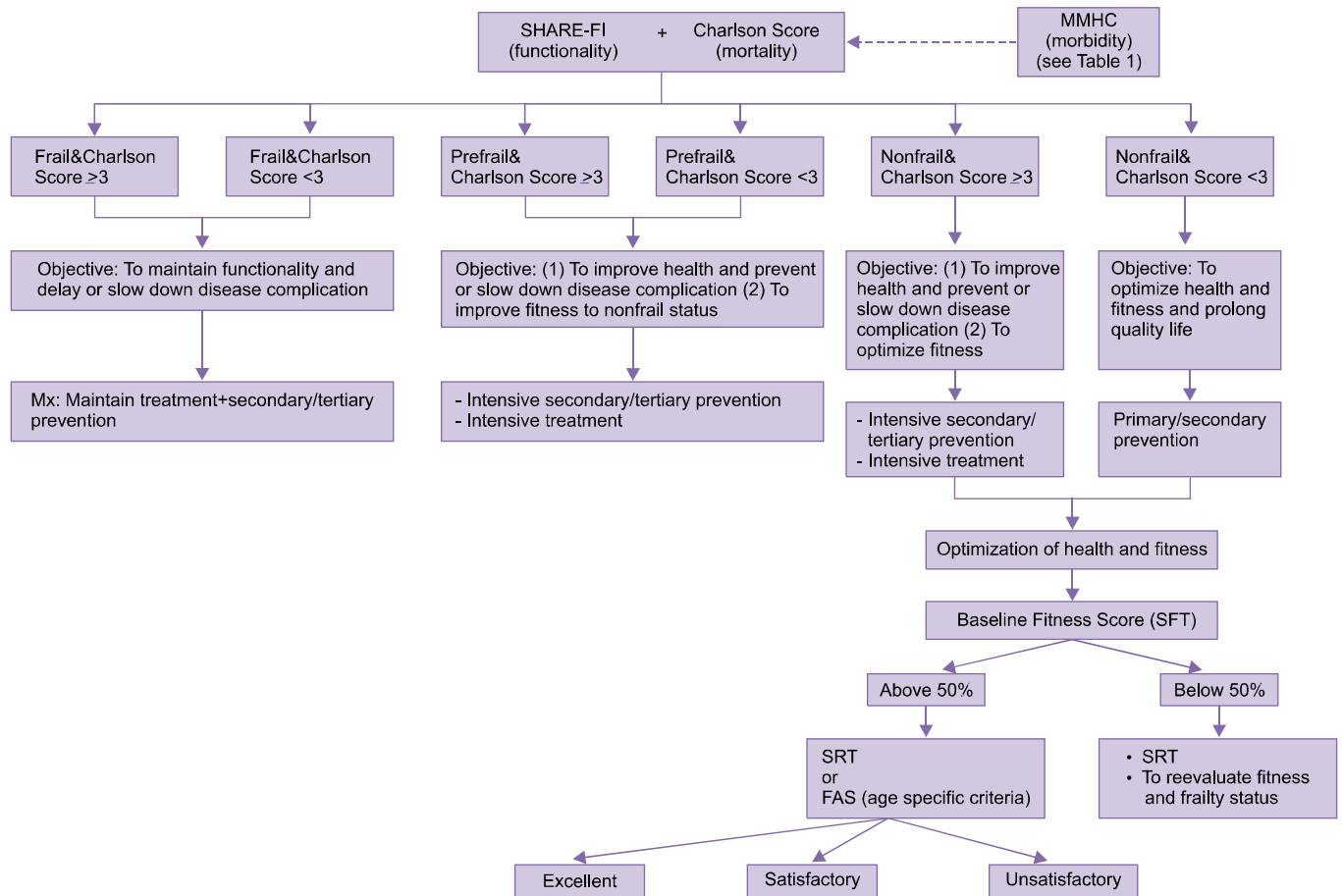
FIG. 1. Flow chart for the Men'S Health Index. SHARE-FI, Survey of Health, Ageing and Retirement in Europe Frailty Instrument; MMHC, Major Mens' Health Concern; SFT, Senior Fitness Test; SRT, Sitting-Rising Test; FAS, Fitness Assessment Score.

TABLE 1. List of health assessment instruments included in the Men's Health Index

Instrument	Source	Population	Validated?	Health indicators	Health outcomes	Results
SHARE-FI	Romero-Ortuno/2010 [2]	12,783 Male subjects Europeans aged 50 and over. 12 European countries (Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium and Israel)	Yes	Exhaustion (energy), form of appetite (weight loss), weakness (muscle strength), walking difficulties (slowness) and low physical activity	DF actor score (i) = z FAT w FAT (i) + z LOSS w loss (i) + z GRIP w GRIP (i) + z FDIFF w FDIFF (i) + z ACT w ACT (i), Where FAT is fatigue, LOSS is loss of appetite, GRIP is grip strength, FDIFF is functional difficulties and ACT is physical activity, as defined in the above frailty definition. The value zfat (i) represents the standardised score on the fatigue measure for the individual i, and similarly for the other standardised scores. The wfat is the weighting associated with that measure on the DF actor and is obtained from the Latent GOLD output	Frailty level according to DFS score is as follow: DFS score < 1.2, nonfrail; 1.2≤DFS score < 3.0, prefrail; DFS score ≥3.0, frail Relative to nonfrail level, the unadjusted OR for mortality over 10 years was 4.8 (39–59) in the prefrail and 14.4 (11.0–18.9) in the frail. Age-adjusted OR was 3.8 (3.1–4.8) in the prefrail and 10.0 (7.4–13.4) in the frail. Mortality prediction over a mean follow-up of 2.4 years: Death rate in the frail group was 22.6%, prefrail, 8.8% and nonfrail group was 2.0% during this follow-up period.
SFT	Jones et al./2002 [3]	7,000 Men and women between the ages of 60 and 94.	Yes	Chair stand, arm curl, 6 min walk, 2 min step, chair sit and reach, back scratch, 8 ft. up & go	Percentile norm tables for comparing individuals' various test scores with others of the same age and sex	Average, below or above average
FAS	Air Force Personnel Center [19]	US air force aged 50–59 years and above 60 years	Unknown	1.5 Mile run/1.0 mile walk, push ups, sit ups, body composition	Total score	Excellent, satisfactory, unsatisfactory
SRT	de Brito et. al./2012 [4]	2002 Adults aged 51–80 years (68% men)	Yes	Sitting-rising test	Score from 0 to 5, with one point being subtracted from 5 for each support used (hand/knee)	Each increment in the SRT score was associated with a 21% reduction in all-cause mortality.
Charlson index	Charlson et al./1987,1994 [5,6]	559 Medical patients	Yes	Weighted index of comorbidity-age combined risk score	Total score of weighted index	Risk of mortality for the next 10 years of their lives or 10 years survivability.
Major Men's concern						
Erectile dysfunction (ED)	Vlachopoulos et al./2013 [7]	14 Studies were included (92,757 participants; mean follow-up, 6.1 years; 16 articles)	Yes	Severity of ED	Cardiometabolic risk factors or disease	Severity of ED predicts cardiometabolic diseases.

TABLE 1. Continued

Instrument	Source	Validated?	Health indicators	Health outcomes	Results
	Thompson et al./2005 [11]	Yes			With covariate adjustment, incident erectile dysfunction was associated with a hazard ratio of 1.25 (95% CI: 1.02–1.53) for subsequent cardiovascular events during study follow-up.
	Araujo et al./2009 [12]	Yes			In multivariate-adjusted models, the association between death due to CVD and all causes with ED were statistically significant. Hazard ratio for moderate/complete ED compared with none/minimal ED was1.43 (95% CI: 1.00–2.05) for CVD mortality.
Lower urinary tract symptoms (LUTS)	Wehrberg et al./2011 [8]	Yes	LUTS severity assessed using the IPSS	CVD and stroke	After adjusted for ED, age, diabetes, total and LDL cholesterol, men with severe LUTS had OR for CVD of 1.28 (95% CI: 1.02–1.61) and OR for stroke of 1.66 (95% CI 1.27–2.17). After adjusted for ED, age, diabetes, total and LDL cholesterol, men with severe LUTS had OR for cardiovascular events of 3.82 (95% CI: 1.32–11.03).
	Armitage et al./2007 [15]	Yes	LUTS (acute urinary retention)	Mortality	Overall, 14.7% of men with spontaneous acute urinary retention and 25.3% men with precipitated acute urinary retention died within the first year.
Testosterone deficiency (TD)	Mulligan et al./2006 [16]	Yes	TD severity (measured by TT level)	Obesity, diabetes, hypertension, hyperlipidaemia, osteoporosis, asthma/COPD, prostatic disease/disorder, chronic pain, headaches	Showed that odds ratios for having hypogonadism were significantly higher in men with hypertension (1.84), hyperlipidaemia (1.47), diabetes (2.09), obesity (2.38), prostate disease (1.29) and asthma or chronic obstructive pulmonary disease (1.40) than in men without these conditions.

(Population column)
- Thompson et al./2005 [11]: Men aged 55 years or older who were randomised to the placebo group (n=9,457) in the Prostate Cancer Prevention Trial at 221 US centres from 1994–2003.
- Araujo et al./2009 [12]: 1,709 Men aged 40–70 years.
- Wehrberg et al./2011 [8]: 2092 Men aged 30–92 Years
- Armitage et al./2007 [15]: Data was extracted from the hospital episode statistics database of admissions to NHS hospitals in England. Inclusion criteria is admissions of men aged over 45 who had primary acute urinary retention.
- Mulligan et al./2006 [16]: All men aged 45 years and older (from 130 practices in the US).

TABLE 1. Continued

Instrument	Source	Population	Validated?	Health indicators	Health outcomes	Results
	Kupelian et al./2006 [17]	Data were obtained from the Massachusetts Male Aging Study, a population-based prospective cohort of 1,709 men observed at 3 time points (T1, 1987–1989; T2, 1995–1997; T3, 2002–2004)	Yes	TD severity (assessed by TT level and clinical signs and symptoms)	Metabolic syndrome	Men in the lowest quartile of Testosterone levels had a 2.64 (CI: 1.1–6.3) RR of developing metabolic syndrome after adjustment for age, BMI and metabolic syndrome score (high BP, self-reported DM, HDL <40mg/dL, waist >40 inches, smoking and self-reported health)
	Laaksonen et al./2004 [18]	702 Middle-aged Finnish men participating in a population-based cohort study	Yes	TD severity	Metabolic syndrome	Men with total testosterone, calculated free testosterone, and SHBG levels in the lower fourth had a several fold increased risk of developing the metabolic syndrome (OR, 2.3; 95% CI, 1.5–3.4; 1.7, 1.2–2.5; and 2.8, 1.9–4.1, respectively) and diabetes (2.3, 1.3–4.1; 1.7, 0.9–3.0; and 4.3, 2.4–7.7, respectively) after adjustment for potential confounders such as cardiovascular disease, smoking, alcohol intake, and socioeconomic status did not alter the associations. Factors related to insulin resistance attenuated the associations, but they remained significant, except for free testosterone.

SHARE-FI, Survey of Health, Ageing and Retirement in Europe Frailty Instrument; SRT, Sitting-Rising Test; SFT, Senior Fitness Test; FAS, Fitness Assessment Score; DF, degree of freedom; DFS, degree of freedom score; OR, odds ratio; US, United States; CI, confidence interval; CVD, cardiovascular disease; NHS, National Health Service; LDL, low-density lipoprotein; TT, total testosterone; COPD, chronic obstructive pulmonary disease; RR, relative risk; BMI, body mass index; BP, blood pressure; DM, diabetes mellitus; HDL, high-density lipoprotein; SHBG, serum hormone-binding globulin.

need to be tested further and assessed in a large-scale study to devise a formula that will enable physicians to predict and advise men on their future health and survival.

RESULTS

1. Men's Health Index

The list of health assessment instruments selected are described in Table 1. Five main tools were identified: Survey of Health, Ageing and Retirement in Europe Frailty Instrument (SHARE-FI), Charlson Index, Senior Fitness Test (SFT), Fitness Assessment Score (FAS), and Sitting-Rising Test (SRT). SHARE-FI is a frailty index that assesses functionality in men. The Charlson Index, on the other hand, determines the risk of death from a constellation of comorbidities or diseases. The SFT, FAS, and SRT assess the fitness status of men. The Major Men's Concerns (MMC), namely, erectile dysfunction (ED), lower urinary tract symptoms (LUTS), testosterone deficiency (TD), and smoking, are important risk factors for assessing morbidity in men. The flow chart depicted in Fig. 1 explains the stepwise approach in using these tools.

On the basis of the frailty and mortality scoring from the SHARE-FI and Charlson Index as well as the morbidity assessed by the MMC, men were stratified into different categories (frail, prefrail, or nonfrail with or without or potential for comorbidities). For each category, we proposed

strategies on how to improve health and function. For men who are frail and at high risk for 10-year mortality, the health goal would be to maintain functionality and delay or retard disease complications. The current treatment should be maintained with or without secondary and tertiary prevention. For men who are prefrail, the objective is to improve health and prevent or slow down disease complications as well as to attempt to improve fitness to nonfrail status. This can be done via intensive secondary or tertiary prevention. For men who are healthy and at low risk of 10-year mortality, the objective is to optimize their life expectancy and health status via primary and secondary prevention. The SFT, SRT, and FAS can be used to classify men's health as excellent, satisfactory, or unsatisfactory.

Another component of the MHI is the mental health assessment. Men with low health risk and good function may not have a good quality of life if they have a high level of mental health burden. Similarly, a man with a high health risk and poor function may not be motivated to optimize his health if he does not have good mental health. The Depression Anxiety Stress Scale-21 (DASS21) is an example of a practical instrument to assess mental health. The scale covers three mental dimensions: anxiety, depression, and stress. Additional information about the DASS21 is available on the developer's website: http://www2.psy.unsw. edu.au/groups/dass/. Men who have mental health problems should be given appropriate counseling and psycho-

TABLE 2. Results of pilot test on Men's Health Index

Variable	Patients							
	A	B	C	D	E	F	G	H
Age (y)	67	57	70	64	61	60	61	55
Weight (kg)	78	61	106	115.4	80	81	61	80
Height (cm)	177.8	161.8	174.5	167.7	171	167	168	172.5
Body mass index (kg/m^2)	24.67	23.3	34.81	41.03	27.36	29.04	21.61	26.89
SHARE-FI frailty score	−0.315	1.013	−0.573	2.387	2.318	−0.315	−0.101	−0.444
Frailty category	Nonfrail	Nonfrail	Nonfrail	Prefrail	Prefrail	Nonfrail	Nonfrail	Nonfrail
CCC score								
Medical condition	0	0	0	1	1	0	0	0
Age risk score	3	2	3	3	3	2	3	2
Total CCC score	3	2	3	4	4	2	3	2
Survival over 10 years (%)	77.5	90.1	77.5	53.4	53.4	90.1	77.5	90.1
Senior fitness test (No. of items passed out of 7)	5/7	5/7	6/7	3/7	5/7	7/7	7/7	6/7
Sitting rising test	9/10	8/10	5/10	6/10	7/10	8.5/10	9.5/10	7/10
FAS (extremely demanding test – used by USAF)	Failed	Failed	Failed	Failed	Failed	Failed	Failed	Passed
Major men's health concerns								
ED (IIEF-5)	Mild ED	No ED	Mild to moderate ED	N/A (no score)	Mild ED	Mild to moderate ED	Mild ED	No ED
LUTS (IPSS)	15	5	9	5	22	4	6	9
TD (ADAM), yes/no	No	No	Yes	Yes	Yes	Yes	Yes	No

SHARE-FI, Survey of Health, Ageing and Retirement in Europe Frailty Instrument; CCC score, Charlson's combined comorbidity-age risk score; FAS, fitness assessment score; USAF, United States Air Force; ED, erectile dysfunction; IIEF, International Index of Erectile Function; LUTS, lower urinary tract symptoms; IPSS, International Prostate Symptom Score; TD, testosterone deficiency; ADAM, androgen deficiency in aging male.

TABLE 3. Depression anxiety stress scale results

Score	Patients							
	A	B	C	D	E	F	G	H
Depression	3	1	2	0	8	2	4	0
	Normal	Normal	Normal	Normal	Moderate	Normal	Normal	Normal
Anxiety	3	3	2	1	5	7	4	3
	Normal	Normal	Normal	Normal	Mild	Moderate	Mild	Normal
Stress	7	0	0	4	10	4	7	4
	Normal	Normal	Normal	Normal	Moderate	Normal	Normal	Normal

logical treatment. Therefore, men's mental health must be assessed and managed accordingly before they are advised to pursue their "post retirement" plan.

2. Pilot test

A pilot test was carried out on eight patients seen in the clinic who volunteered to take part in this study. The patients were all men in the periretirement age. The details of the patients and the results are displayed in Tables 2, 3.

Patients B, F, H were all predicted to have a 90.1% chance of survival over 10 years on the basis of the Charlson Index. They were also found to be nonfrail when assessed with the SHARE-FI score. Their fitness test results were also excellent. In these men, the aim should be to optimize health and fitness as well as to prolong quality of life. They have the option to pursue any path they wish, be it work, leisure, or any physically or mentally demanding tasks. They are fit and unlikely to jeopardize their health or life even if they cling to their highly stressful and responsible jobs or positions. Patient F, however, had a moderate score for anxiety but a normal score for stress. He may need to tone down to a less demanding job.

On the other hand, patients D and E were noted to be prefrail in their SHARE-FI score. Their predicted survival over 10 years was only 53.4%. They also fared poorly on their fitness test. Therefore, these men should aim to prevent or slow down disease progression and at the same time improve their fitness to nonfrail status through intensive treatment and secondary and tertiary prevention. Should they need to work for financial reasons, they are advised to undertake a less demanding or part-time job. This was especially so for patient E, who had mild to moderate DASS21 scores.

If patients are found to be frail with a very poor Charlson Index indicating poor survival over 10 years and in a state of poor mental health as depicted by the DASS21 scores, the aim would be for these patients to step down from any demanding and stressful jobs, undertake lifestyle changes seriously, and visit their physicians regularly to optimize secondary or tertiary prevention. The objective in these patients would be to maintain functionality and delay or slow down disease complications.

DISCUSSION

This proposed MHI is the first comprehensive tool for assessing and stratifying the health status of men by use of a systematic approach. Various health prediction tools were used as a framework to prognosticate the mortality, morbidity, and functionality of men. The aim is to assess and stratify older men with the intention of optimizing their health and functional status. The step-by-step approach is simple and can be implemented in an outpatient setting.

Although the health and life expectancies of men are steadily increasing, a significant number of men will experience various degrees of ill health or frailty when they reach 50 to 60 years of age. We believe that the SHARE-FI scale can be used to pick up about 80% of the men in this retiring age group who are not frail [2]. These nonfrail men will undergo physical fitness assessment by use of the SFT, FAS, or SRT, which will reaffirm their fitness level to be either above or below the average of men in their early 60s [3,4].

Men who have a Charlson combined comorbidity-age risk score of 1 or 2 are fit and are therefore able to pursue their "post retirement" life optimally. On the other hand, a combined Charlson score of 3 (23% mortality over 10 years) is a warning sign and men with this score should be advised to intensify their health maintenance and secondary preventive measures. A Charlson combined risk score of 4 and above predicts high mortality over 10 years. Men in this category must be advised of their high-risk status and, if necessary, review their life goals and priorities in view of their shorter life span and poorer health status [5,6].

In the MHI, we also propose using the MMC, i.e., ED, LUTS, and TD, to assess men's health status. The severity of these three major men's concerns has been shown to predict future cardiometabolic diseases. ED, LUTS, and TD are risk factors associated with metabolic syndrome [7,8], which increases the risk of cardiovascular diseases and type 2 diabetes mellitus by three to five folds [9]. The diagnosis of ED has been reported to predict coronary artery disease with a lead time of 2 to 5 years [10-14]. Health practitioners should not miss the opportunity to implement preventive health care and reduce the risk factors for cardiometabolic diseases in men presenting with MMC. Last, we also assess the mental health status of men, because

this component is vital in determining the quality of life remaining.

We believe that the concept of assessing, stratifying, and optimizing men's health should be incorporated into routine health care, as for women's health. We believe that this holistic approach to managing men's health can be implemented by using the MHI. This index is particularly useful to primary care physicians, who are in a strategic position to engage men at the periretirement age in a conversation about their life goals on the basis of their current and predicted health status. The constellation of tests and instruments for our MHI have been pilot tested for practicality and can be completed between 30 and 60 minutes.

The MHI requires further validation, ideally in a cohort study that follows men up over a period of about 10 years. An overall index or aggregate scores of the MHI with various dimensions can then be developed for research or policy planning purposes. The proposed instruments used in the MHI may need to be modified subject to the availability of manpower and resources in clinical practice. Future men's health indexes should look into applying similar concepts to those below 50 years of age so that their health can be optimized at an early stage before disease sets in (primary prevention).

Primary prevention includes health promotion and requires action on the determinants of health to prevent disease occurring. It has been described as refocusing upstream to stop people from falling in to the waters of disease. Secondary prevention is essentially the early detection of disease, followed by appropriate intervention, such as health promotion or treatment. Tertiary prevention aims to reduce the impact of the disease and to promote quality of life through active rehabilitation [20].

The limitation of the proposed MHI is that it has not been validated and therefore should be tested for its predictive value in a cohort study. This longitudinal study has already been planned and will be launched in a confined community involving about 1,000 men between the ages of 50 and 70 years.

CONCLUSIONS

The proposed MHI is the first comprehensive tool to assess, stratify, and optimize men's health. It may be used by clinicians to manage men at retirement age and help them plan for the next phase of their life on the basis of their health status. The MHI should be further tested in the community and clinical setting to assess its validity.

CONFLICTS OF INTEREST
The authors have nothing to disclose.

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