Supplemental Materials for

Supplemental Appendix 1

☐ PROMPT SHEET: ENGLISH

☐ Erectile dysfunction (ED) is common in patients with diabetes.
☐ Up to 70% of diabetic patients have ED.
☐ Men with ED are more likely to suffer from heart disease.
☐ ED can be treated effectively.
☐ Your doctor is willing to discuss your sexual problem if you wish to.

You may want to ask your doctor the following questions:

☐ I do not want to talk about ED

☐ I want to discuss the risk factor of getting ED

☐ I want to discuss treatment for ED

☐ I want to discuss the severity of ED

LASTED

KNOWLEDGE TRANSLATION TOOLS IN THE MANAGEMENT OF ERECTILE DYSFUNCTION

MANAGING ERECTILE DYSFUNCTION EFFECTIVELY
DEFINITION OF ERECTILE DYSFUNCTION (ED)

ED is defined as persistent inability to maintain a penile erection sufficient for sexual performance\(^1\)

Despite 5 in 10 men have ED in general, it is more common among the diabetics where 9 in 10 suffer from ED\(^2,3\)
DEFINITION OF ERECTILE DYSFUNCTION (ED)

ED is defined as persistent inability to maintain a penile erection sufficient for sexual performance¹

- Most clinicians and researchers defined the duration of at least 3 - 6 months
- Prevalence of ED in healthy men age 40 to 70 years old is 52%²
- Prevalence of ED is higher in diabetes up to 80 - 90%³
- Unfortunately, ED is always underscreened, underdiagnosed and undertreated
MECHANISM OF PENILE ERECTION

Erection is a complex process involving various systems including the brain, nerves, hormones and blood vessels.
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Following a psychological or physical stimulation, the brain sends signals to the penis through the nervous system causing the smooth muscle of the corpus cavernosum to relax.

Blood vessel lumens will open wide and more blood flows through the vessels, filling the corpus cavernosum.

Simultaneously, the veins that carry blood away from the penis is shut down. Hence, the blood is trapped in the corpus cavernosum, causing the penis to enlarge, and to erect as well as becoming hard.
CAUSES OF ERECTILE DYSFUNCTION

ORGANIC

PSYCHOGENIC

MIXED
## Causes of Erectile Dysfunction

<table>
<thead>
<tr>
<th>Causes of ED</th>
<th>Common Causes</th>
<th>Pathophysiology</th>
</tr>
</thead>
</table>
| Vasculogenic      | Hypertension, atherosclerosis, dyslipidemia, diabetes mellitus, obesity, tobacco use | • Impaired penile veno-occlusion  
• Inadequate arterial inflow |
| Hormonal          | Low testosterone, hyperprolactinemia, diabetes mellitus, chronic opioid use   | • Loss of libido  
• Inadequate Nitric Oxide release  
• Morphological changes in the penis |
| Neurogenic        | Stroke, Alzheimer’s disease, spinal cord injury, diabetic neuropathy          | • Interrupted neuronal innervation  
• Failure to initiate Nitric Oxide release |
| Psychogenic       | Depression, psychological stress, performance anxiety, relationship problems | • Impaired Nitric Oxide release  
• Loss of libido  
• Sympathetic nervous system activation |
| Systemic Disease  | Aging, diabetes mellitus, chronic renal failure, generalized atherosclerotic disease | • Multifactorial  
• Neuronal and vascular dysfunction |
| Drug-induced      | Antihypertensives, antiandrogens, antidepressants, alcohol abuse              | • Central nervous system suppression  
• Decreased libido  
• Vascular insufficiency |
SYMPTOMS OF ERECTILE DYSFUNCTION

Inability to achieve/keep an erection

OTHER POSSIBLE SYMPTOMS

Premature ejaculation

Reduced sex drive

Low testosterone level
SYMPTOMS OF ERECTILE DYSFUNCTION\textsuperscript{4,5}

- Difficulty in getting an erection
- Difficulty sustaining an erection long enough for sexual intercourse
- Reduced sexual drive and libido
- Concomitant premature ejaculation

OTHER POSSIBLE SYMPTOMS

- Premature ejaculation
- Reduced sex drive
- Low testosterone level
ERECITION HARDNESS SCORE (EHS)

1. TOFU
   The penis is large but not hard

2. PEELED BANANA
   The penis is hard but not hard enough for penetration

3. UNPEELED BANANA
   The penis is hard enough for penetration but not completely hard

4. CUCUMBER
   The penis is hard and completely rigid

SEVERE ERECTILE DYSFUNCTION  MODERATE ERECTILE DYSFUNCTION  SUBOPTIMAL ERECTION  OPTIMAL ERECTION
ERECTION HARDNESS SCORE (EHS)

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SEVERE ERECTILE DYSFUNCTION  MODERATE ERECTILE DYSFUNCTION  SUBOPTIMAL ERECTION  OPTIMAL ERECTION

EHS is a single item patient reported outcome for scoring erection hardness and can be used to initially assess the severity of Erectile Dysfunction.
ERECTILE DYSFUNCTION AND CARDIOVASCULAR RISK\textsuperscript{7,8}

There is a very strong link between ED and heart disease.

If a man has ED, he has a greater risk of having heart disease.
There is a very strong link between ED and heart disease:

- If a man has ED, he has a greater risk of having heart disease
- ED and heart disease share many of the same risk factors and often coexist.
- ED is also an independent marker of increased risk for heart disease
- ED commonly occurs in the presence of silent heart disease and there’s a window period of 2 to 5 years from the onset of ED to a cardiac event.
CARDIAC RISK STRATIFICATION

Cardiovascular risk stratification is important in deciding appropriate treatment for ED as cardiac events could be reflected by sexual performance.

The amount of energy used by the body during sexual activity

= =

Briskly climbing two flight of stairs in 10 seconds

Walking 1 mile (1.6 km) on the flat surface in 20 minutes
Sexual activity is comparable to mild to moderate physical activity in the range of 3 to 5 MET (Metabolic Equivalent of Task), e.g. climbing two flights of stairs or walking 1 mile (1.6 km) on the flat surface in 20 minutes.

Sexual activity is reasonable for patients who can exercise 3 to 5 MET without any cardiac symptoms such as chest pain, shortness of breath or low blood pressure.

Cardiovascular risk stratification is important in deciding appropriate treatment for ED as cardiac events could be reflected by sexual performance.

Patients with ED should be risk-stratified based on the table below (adapted from The Princeton III Consensus).

<table>
<thead>
<tr>
<th>LOW–RISK CATEGORY</th>
<th>INDETERMINE–RISK CATEGORY</th>
<th>HIGH–RISK CATEGORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic, &lt;3 risk factors for CAD</td>
<td>≥3 risk factors for CAD (excluding sex)</td>
<td>High-risk arrhythmias</td>
</tr>
<tr>
<td>(excluding sex)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild, stable angina</td>
<td>Moderate, stable angina</td>
<td>Unstable or refractory angina</td>
</tr>
<tr>
<td>(evaluated and/or being treated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncomplicated previous MI</td>
<td>Recent MI (&gt;2, &lt;6 weeks)</td>
<td>Recent MI (&lt;2 weeks)</td>
</tr>
<tr>
<td>LVD/CHF (NYHA class I or II)</td>
<td>LVD/CHF (NYHA class III)</td>
<td>LVD/CHF (NYHA class IV)</td>
</tr>
<tr>
<td>Post-successful coronary revascularisation</td>
<td>Non-cardiac sequelae or atherosclerotic disease</td>
<td>Hyperthrophic obstructive and other</td>
</tr>
<tr>
<td></td>
<td>(e.g. stroke, peripheral vascular disease)</td>
<td>cardiomyopathies</td>
</tr>
<tr>
<td>Controlled hypertension</td>
<td></td>
<td>Uncontrolled hypertension</td>
</tr>
<tr>
<td>Mild valvular disease</td>
<td></td>
<td>Moderate-to-severe valvular disease</td>
</tr>
</tbody>
</table>

CAD = coronary artery disease; CHF = congestive heart failure; LVD = left ventricular dysfunction; MI = myocardial infarction; NYHA = New York Heart Association.
CAR DiAC RISK STRATIFICATION

**LOW RISK**
Low-risk individuals can initiate or resume sexual activity and begin ED treatment without further testing or evaluation

**INDETERMINATE RISK**
Indeterminate-risk individuals need to be referred for Exercise Stress Test to assess exercise ability

**HIGH RISK**
High-risk individuals should be referred for cardiac assessment and treatment
CARDIAC RISK STRATIFICATION

**LOW RISK**

Sexual activity does not represent significant cardiac risk. Patients can generally perform exercise of modest intensity without symptoms. They can resume sexual activity and treatment for ED can be initiated without further evaluation.

**INDETERMINATE RISK**

Patients with uncertain cardiac condition requires stress test evaluation before the resumption of sexual activity. Completing 4 minutes of the standard Bruce treadmill protocol without symptoms, arrhythmias, or a fall in systolic BP indicates that sexual activity is safe.

**HIGH RISK**

Cardiac condition that is severe and/or unstable for sexual activity carry significant cardiovascular risk. High risk patients have moderate to severe symptomatic heart disease and should be referred for cardiac assessment and treatment. Sexual activity should be stopped until the patient’s cardiac condition has been stabilized by treatment.

*Adapted from The Princeton III Consensus*
TREATMENT OF ERECTILE DYSFUNCTION

LIFESTYLE CHANGES

ORAL MEDICATION

VACUUM ERECTION DEVICE

INTRACAVERNOUS INJECTION

PENILE IMPLANT
TREATMENT OF ERECTILE DYSFUNCTION

Treatment of Erectile Dysfunction involves a multimodal approach

NON PHARMACOLOGICAL

PHARMACOLOGICAL

SURGICAL

SILDENAFIL

ORAL MEDICATION

VACUUM ERECTION DEVICE

PENILE IMPLANT

INTRACAVERNOUS INJECTION
LIFESTYLE CHANGES

Physical Activity

Stop Smoking

Reduce Alcohol Intake

Weight Reduction

Dietary Modification
LIFESTYLE CHANGES

Physical Activity
Moderate and high physical activities for 150mins per week are associated with a lower risk of ED.

Stop Smoking
Both the direct use of tobacco and secondhand exposure are consolidated risk factors for ED.

Reduce Alcohol Intake
72% of chronic and persistent alcohol abusers had male sexual dysfunction.

Weight Reductions
Overweight, obesity and metabolic syndrome are associated with an increased risk of ED.

Dietary Modification
Dietary modification with high content of whole grain foods, legumes, vegetables and fruits are associated with a reduced risk of ED. Besides, limiting red meat, full fat dairy products, as well as high in added sugar foods and beverages, are also important to improve ED.
## ORAL MEDICATION

<table>
<thead>
<tr>
<th>BRAND NAME</th>
<th>SILDENAFIL</th>
<th>TADALAFIL</th>
<th>VARDENAFIL</th>
<th>AVANAFIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>25 - 100mg/day</td>
<td>5 - 20mg/day PRN 2.5 - 5mg/day OD</td>
<td>5 - 20mg/day</td>
<td>50 - 200mg/day</td>
</tr>
<tr>
<td>On-Demand use</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Daily use</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Administration time</td>
<td>1 hour before sex</td>
<td>30 mins before sex</td>
<td>30 mins before sex</td>
<td>15 mins before sex</td>
</tr>
<tr>
<td>Common side effects</td>
<td>Facial blushing, Headache, Indigestion</td>
<td>Headache, Indigestion</td>
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</tr>
</tbody>
</table>
# Oral Medication

## Comparison Table

<table>
<thead>
<tr>
<th></th>
<th>Sildenafil</th>
<th>Tadalafil</th>
<th>Vardenafil</th>
<th>Avanafil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand Name</strong></td>
<td>Viagra</td>
<td>Cialis</td>
<td>Levitra</td>
<td>Spedra</td>
</tr>
<tr>
<td><strong>Dose</strong></td>
<td>25 - 100mg/day</td>
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### Contraindications for PDE 5 Inhibitor
- History of myocardial infarction, stroke, or life-threatening arrhythmia within the last 6 months
- Uncontrolled hypertension (BP > 170/100 mmHg)
- Patients with unstable angina, angina with sexual intercourse, or congestive heart failure (NYHA IV)
- Patients who are using any form of organic nitrate (e.g. nitroglycerine, isosorbide mononitrate, and isosorbide dinitrate)
A vacuum erection device (VED) is an external acrylic pump to help a man attain and maintain an erection. The VED consists of a constrictive ring and a cylinder that goes over the penis with a battery-operated or manual pump.
VACUUM ERECTION DEVICE\(^{4,5}\)

- A vacuum erection device (VED) is an external acrylic pump to help a man attain and maintain an erection.

- The VED consists of a constrictive ring and a cylinder that goes over the penis with a battery-operated or manual pump.

- The VED provides passive engorgement of the penis, and the constrictive ring at the base of the penis helps to retain blood within the corpora cavernosa of the penis.

- The constrictive ring can be left on safely for up to 30 minutes to allow for successful intercourse.

- The most common adverse events include pain, inability to ejaculate, petechiae, bruising, and numbness, which occur in < 30% of patients.
Patients not responding to oral drugs may be offered intracavernous injections. The success rate of intracavernous injection is up to 85%. Alprostadil is the most common intracavernous injection drug used for ED treatment.
INTRACAVERNOSUS INJECTIONS\textsuperscript{4,5}

- Patients not responding to oral drugs may be offered intracavernous injections.

- The success rate of intracavernous injection is up to 85%.

- Alprostadil is the most common intracavernous injection drug used for ED treatment.

- Most efficacious as monotherapy at a dose of 5 - 40 \textmu g.

- The erection appears after 5 - 15 minutes and lasts according to the dose injected.

- Complications of intracavernous injection include penile pain, prolonged erections, priapism, and fibrosis.
Penile prosthesis may be considered if pharmacotherapy failed or for those who prefer a permanent solution. The commonest prosthesis is the inflatable type which consists of two attached cylinders, a reservoir and a pump. Satisfaction rates with the prosthesis are up to 90%.
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• The commonest prosthesis are inflatable type which consists of two attached cylinders, a reservoir and a pump.

• Satisfaction rates with the prosthesis are up to 90%.

• When the penis is inflated, the prosthesis makes the penis hard and thick, similar to a natural erection.

• Penile implant surgery can be done either as inpatient or outpatient setting by experts.

• A man can resume sexual intercourse by 6 weeks after surgery.

• The two main complications of penile prosthesis implantation are mechanical failure and infection.
REFERENCES