

PRIMARY-PREVENTION ICDs IN LMICs

Lifesaving therapy — or lifelong financial burden?

DR QURBAN HUSSAIN KHAN

Assistant Professor of Cardiac Electrophysiology
Medical Superintendent • Rawalpindi Institute of Cardiology

8 AUGUST 2026 • PC HOTEL, KARACHI



ICDs SAVE LIVES. VALUE DEPENDS ON SELECTION.

In LMICs, eligibility is necessary—not sufficient.

Preventable arrhythmic risk.
Competing mortality.
Lifetime service capacity.



SCD IS GLOBAL; ACCESS IS NOT.

>5M

estimated sudden
cardiac deaths
worldwide each year

≈80%

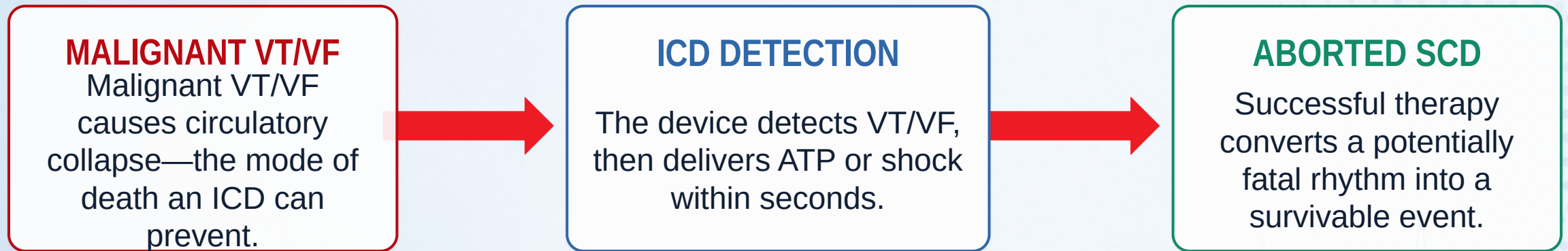
of global cardiovascular
deaths occur in
low- and middle-income
countries

1.7%

of eligible Asian HFrEF
patients received an ICD
vs 56% in North
America

SCD is undercounted where surveillance is weakest—but the access gap is unmistakable.

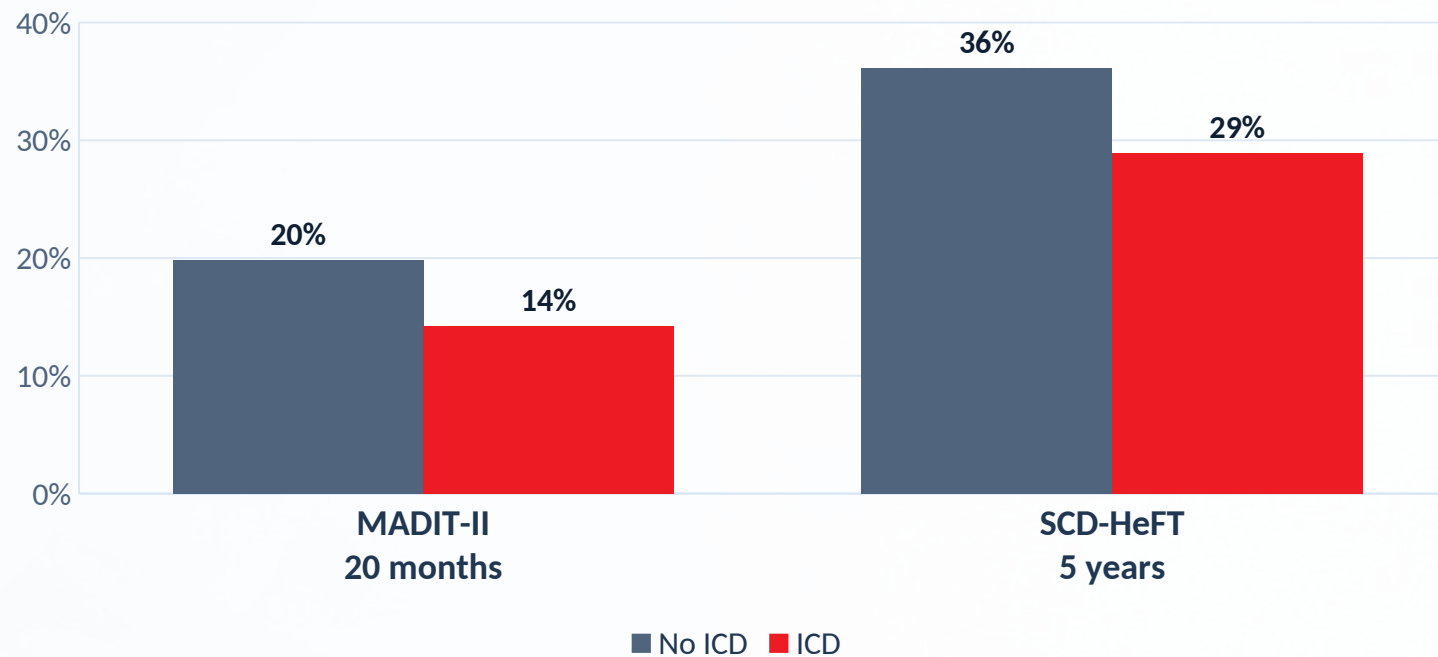
AN ICD ABORTS VT/VF — NOT COMPETING DEATH.



Competing risk dilutes benefit

Pump failure • stroke • infection • renal failure • cancer • frailty remain unaffected.

LANDMARK TRIALS: 5.6–7.2 FEWER DEATHS PER 100.



MADIT-II

Prior MI • LVEF $\leq 30\%$
20-month horizon
Mortality 19.8% $\rightarrow$ 14.2%
ARR 5.6% • NNT ≈ 18

SCD-HeFT

NYHA II–III • LVEF $\leq 35\%$
5-year horizon
Mortality 36.1% $\rightarrow$ 28.9%
ARR 7.2% • NNT ≈ 14

MODERN GDMT HAS LOWERED SUDDEN-DEATH RISK.

44%
DECLINE

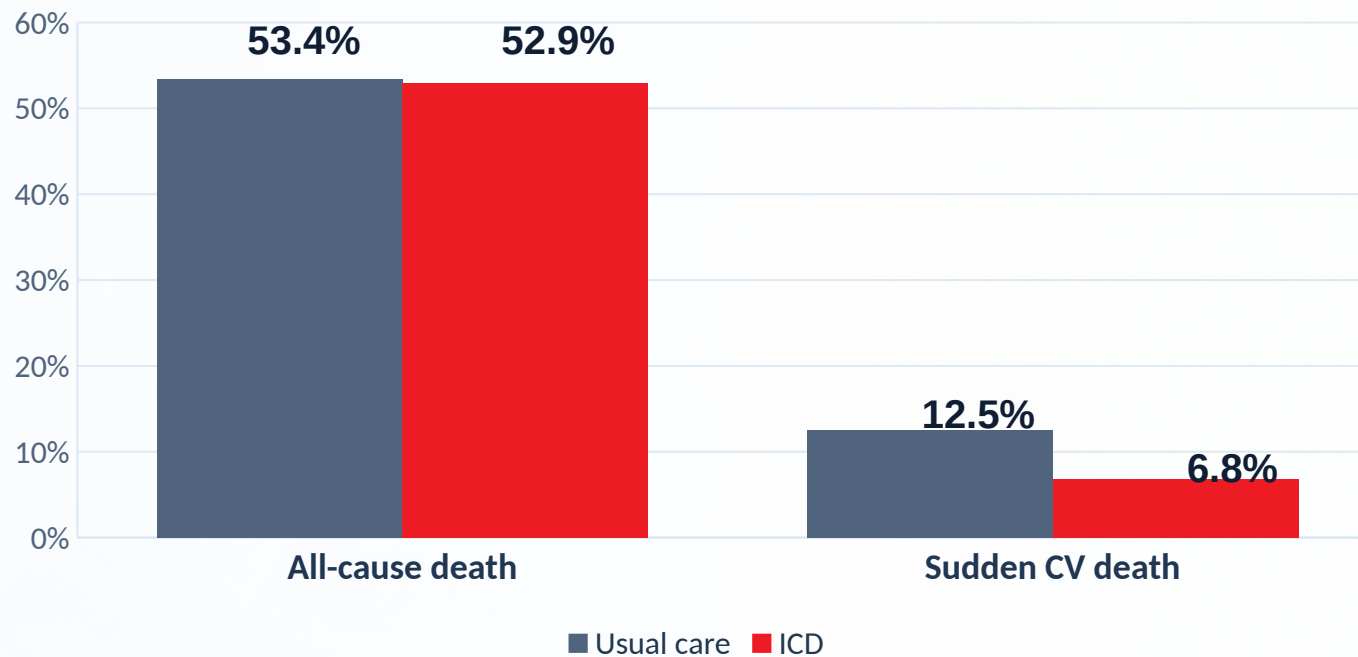
in sudden-death rates across
HFrEF trials
from 1995 to 2014—before
full ARNI/SGLT2i adoption

THE FOUR-PILLAR ERA

- 1 ARNI / ACEi / ARB
- 2 Evidence-based beta-blocker
- 3 Mineralocorticoid antagonist
- 4 SGLT2 inhibitor

OPTIMIZE FOUR-PILLAR GDMT • ALLOW RECOVERY • THEN REASSESS EF

DANISH: SUDDEN CV DEATH FELL; SURVIVAL DID NOT.



13 YEARS

extended follow-up
nonischemic HFrEF

Sudden CV death:
12.5% → 6.8%

All-cause mortality:
53.4% vs 52.9%.

Competing deaths erased
the survival signal.

ICD sudden-death benefit was concentrated at ≤ 70 years; all-cause mortality was unchanged.

GUIDELINES REQUIRE MORE THAN EF $\leq 35\%$.

1

RIGHT SUBSTRATE

Ischemic or nonischemic
HFrEF
LVEF $\leq 35\%$ + NYHA II–III
—or—
post-MI LVEF $\leq 30\%$ + NYHA
class I

2

RIGHT TIME

≥ 40 days after MI
 ≥ 3 months optimized GDMT
Reassess after
revascularization
Confirm persistent LV
dysfunction

3

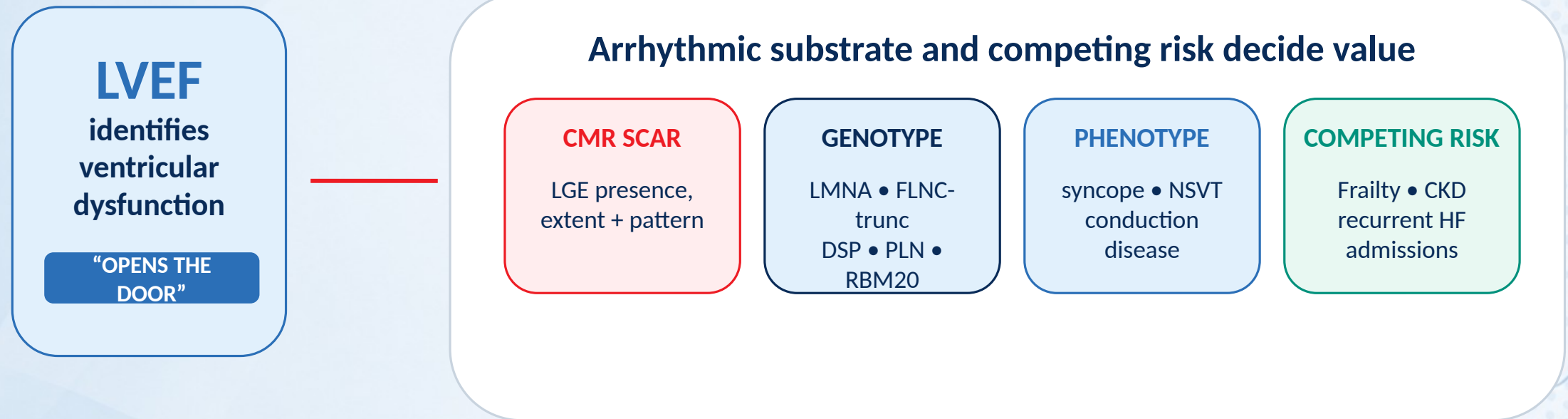
RIGHT PROGNOSIS

Expected survival >1 year
Acceptable functional
trajectory
Low competing mortality
Patient goals + shared
decision

US: CLASS I WHEN THESE ALIGN • ESC: STRENGTH VARIES BY AETIOLOGY, SCAR & GENOTYPE

BEYOND EF: SCAR, GENOTYPE & COMPETING RISK.

EF opens the door; substrate and competing mortality decide value.



HIGH-RISK SCAR OR GENOTYPE MAY MATTER EVEN WHEN EF >35%

LMIC rule: advanced testing only when it can change the device decision.

LMICs CHANGE THE ECONOMICS — NOT THE BIOLOGY.

≈52%

PAKISTAN HEALTH SPENDING
PAID OUT-OF-POCKET (2023)

At ≈52% out-of-pocket spending,
one ICD can become a catastrophic
household expense.

1 → 160

ICD IMPLANTS PER MILLION
ACROSS PUBLISHED ASIA-PACIFIC
DATA

Published rates span 1 to 160
implants/million: a system gap—not a
biology gap.

LIFETIME VALUE = DEVICE + SAFE IMPLANT + FOLLOW-UP + REPLACEMENT

THE DEVICE PRICE IS ONLY THE ENTRY FEE.

01**PURCHASE + IMPLANT**

Generator • lead
lab/theatre • staff •
admission

02**FOLLOW-UP**

Programmer • clinic
• travel
shock triage •
caregiver time

03**ADVERSE EVENTS**

Infection
Inappropriate
therapy
Lead revision •
extraction

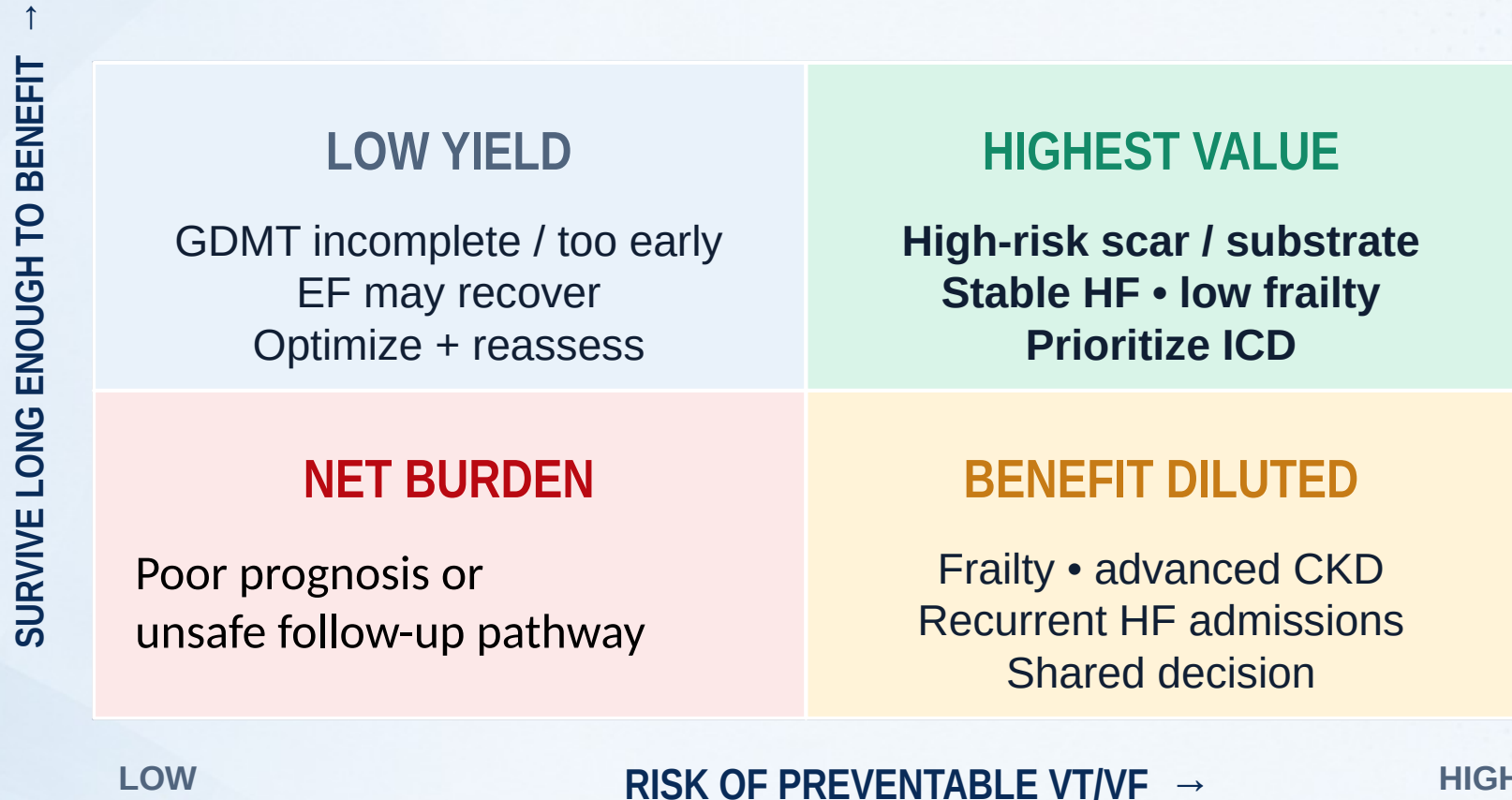
04**REPLACEMENT**

Battery depletion •
lead failure
reimplantation • end-
of-life planning

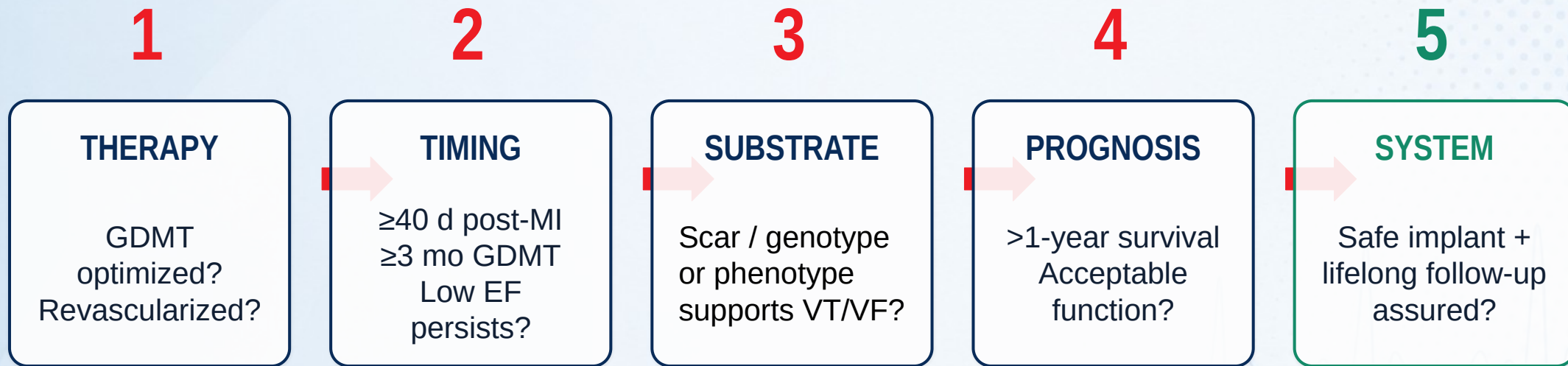
AFFORDABILITY = LIFETIME DEVICE-PATHWAY COST

The purchase price is the first line in a lifelong service commitment.

VALUE NEEDS ARRHYTHMIC RISK + TIME TO BENEFIT.



A FIVE-FILTER LMIC VALUE SCREEN.



ONE “NO” → OPTIMIZE, REASSESS OR CONVENE MDT.

SPEND SMARTER BEFORE RATIONING HARDER.

- 01 PROCURE FOR VALUE**
Pooled purchasing • warranty/programmer support • transparent subsidies
- 02 MATCH DEVICE TO NEED**
Single-chamber ICD unless pacing/CRT is indicated • avoid excess hardware
- 03 PROGRAM SAFELY**
High-rate / long-detection • ATP-first when appropriate • review every therapy
- 04 BUILD THE SERVICE**
Infection bundle • registry • device clinic • nurse-led follow-up • shock triage

MADIT-RIT: 79% LESS INAPPROPRIATE THERAPY • 55% LOWER MORTALITY (RELATIVE)

TWO LOW-EF PATIENTS. TWO VERY DIFFERENT VALUES.

A 52 YEARS • ISCHEMIC

- Anterior MI; PCI 6 months ago
- LVEF 28%; NYHA II
- Four-pillar GDMT optimized
- Independent; preserved renal function
- High proportional arrhythmic risk

PRIORITIZE ICD

B 76 YEARS • NONISCHEMIC

- LVEF 30%; advanced NYHA III–IV
- Frailty + stage 4 CKD
- Recurrent HF admissions
- Uncertain long-term follow-up
- High competing mortality

MDT REVIEW • LOW NET BENEFIT

Same EF; different arrhythmic risk, prognosis and support.

AN ANSWER

LIFESAVING — WHEN TARGETED, TIMED & SUPPORTED.

TARGET

High arrhythmic substrate
Scar/genotype if relevant
Low competing mortality

TIME

≥40 d post-MI • ≥3 mo GDMT
After revascularization
recovery
Reassess persistent low EF

SUPPORT

Safe implant + programming
Device clinic + shock triage
Replacement/end-of-life plan

SELECTIVE ACCESS, NOT BLANKET DENIAL: MAXIMIZE LIVES SAVED PER DEVICE.

EVIDENCE SNAPSHOT

STUDY	POPULATION	KEY RESULT	LMIC INTERPRETATION
MADIT-II 2002	Prior MI LVEF $\leq 30\%$	Mortality 19.8% $\rightarrow$ 14.2% HR 0.69	Strong ischemic evidence; absolute benefit $\sim 5.6\%$
SCD-HeFT 2005	ICM / NICM LVEF $\leq 35\%$; NYHA II–III	5-y mortality 36.1% $\rightarrow$ 28.9% ARR 7.2% • NNT ≈ 14	NNT ≈ 14 over 5 years; benefit needs time
DANISH 2016–2025	NICM LVEF $\leq 35\%$	All-cause 53.4% vs 52.9% Sudden CV death HR 0.54	No overall survival gain; sudden CV-death benefit mainly ≤ 70 y
Shen et al. 2017	40,195 HFrEF patients 12 trials, 1995–2014	Sudden-death rate fell 44%	Optimize modern GDMT before device commitment

MINIMUM VIABLE ICD SERVICE

- ✓ Document optimized GDMT + timing before approval
- ✓ MDT for scar/genotype, frailty, renal disease, prognosis + goals
- ✓ Choose the device: ICD vs CRT-D; single vs dual chamber
- ✓ Infection-prevention bundle + operator-volume audit
- ✓ Standard high-rate / long-detection programming
- ✓ Device clinic + shock triage + scheduled surveillance
- ✓ Registry: indication, complications, therapies, mortality, replacement
- ✓ Generator-replacement + end-of-life deactivation policy

AN ICD WITHOUT A SERVICE IS NOT A COMPLETE INTERVENTION.

Heidenreich et al., *Circulation*. 2022 • Zeppenfeld et al., *Eur Heart J*. 2022 • Aktaa et al., *Europace*. 2023



THANK YOU

www.qurbankhan.com

