THE MULTIDISCIPLINARY APPROACH TO ORAL ANTIBIOTIC TREATMENT OF ENDOCARDITIS

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8/21/26

Financial Disclosures

- Provided educational talks for Philips Healthcare

Objectives

- Identify the burden of hospitalizations for patients with endocarditis
- Identify the role of multidisciplinary teams in treatment of endocarditis
- Demonstrate to ability to identify appropriate candidates for oral antibiotic therapy for endocarditis
- Develop an understanding of potential oral antibiotic regimens for endocarditis
- Review outcomes for patients treated with oral antibiotics

Background - Infective Endocarditis

- 1998-2009: ~43,000 cases per year in the U.S
- In hospital mortality 15-20%
- Lack of randomized controlled trials complicates patient management

Epidemiology - Infective Endocarditis

Contemporary Trends in Native Valve Infective Endocarditis in United States (from the National Inpatient Sample Database)

Muhammad Zia Khan, MD,[a,*] Muhammad Bilal Munir, MD,[b,c] Muhammad U. Khan, MD,[a] Safi U. Khan, MD,[a] Mina M Benjamin, MD,[a] and Sudarshan Balla, MD[b]

- 2012 – 2016: ~40,000 cases per year in the U.S
  - Peaked at 54,000 cases in 2016
- In hospital mortality 10.8%
- 2003 – 2016: Proportion of endocarditis caused by injection drug use increased from 16 per 100,000 to 22 per 100,000

Epidemiology - HIV

- 31,800 new HIV infections diagnosed in 2022

???

Infective Endocarditis at Michigan Medicine

- Between July 1, 2014 and June 30, 2015
  - 179 patients identified
  - 105 cases of definite and possible endocarditis by Duke Criteria
  - 78 cases of definite endocarditis
  - 68 cases of definite endocarditis AND at least 1 indication for surgery per the 2015 American Heart Association guidelines

Infective Endocarditis at Michigan Medicine

- 68 patients with definite endocarditis and surgical indications
  - Overall in-hospital mortality: 29.4%

Infective Endocarditis Mortality

Infective Endocarditis at Michigan Medicine

- 17 patients (25%) without a documented cardiac surgery consult
  - 15% of patients had no consult placed
  - 10% of patients had a consult placed but there was no documentation
  - In-hospital mortality for these patients: 47.1%

Infective Endocarditis at Michigan Medicine

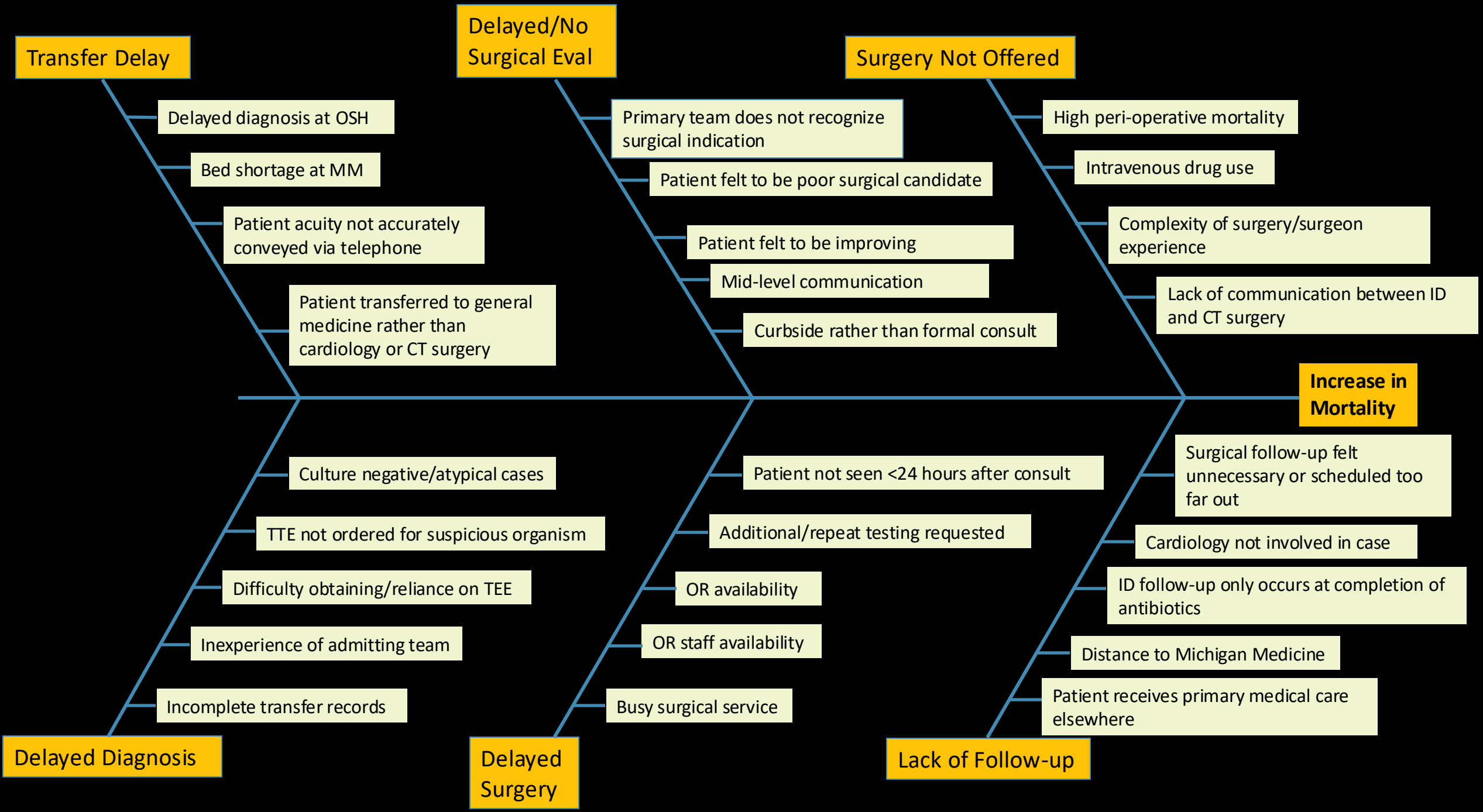
- 17 patients (25%) without a documented cardiac surgery consult
  - In-hospital mortality for these patients: 47.1%
- 51 patients with documented cardiac surgery consultation
  - 26 patients managed medically
    - In-hospital mortality: 38.5%, 2-year mortality 65.4%

Infective Endocarditis at Michigan Medicine

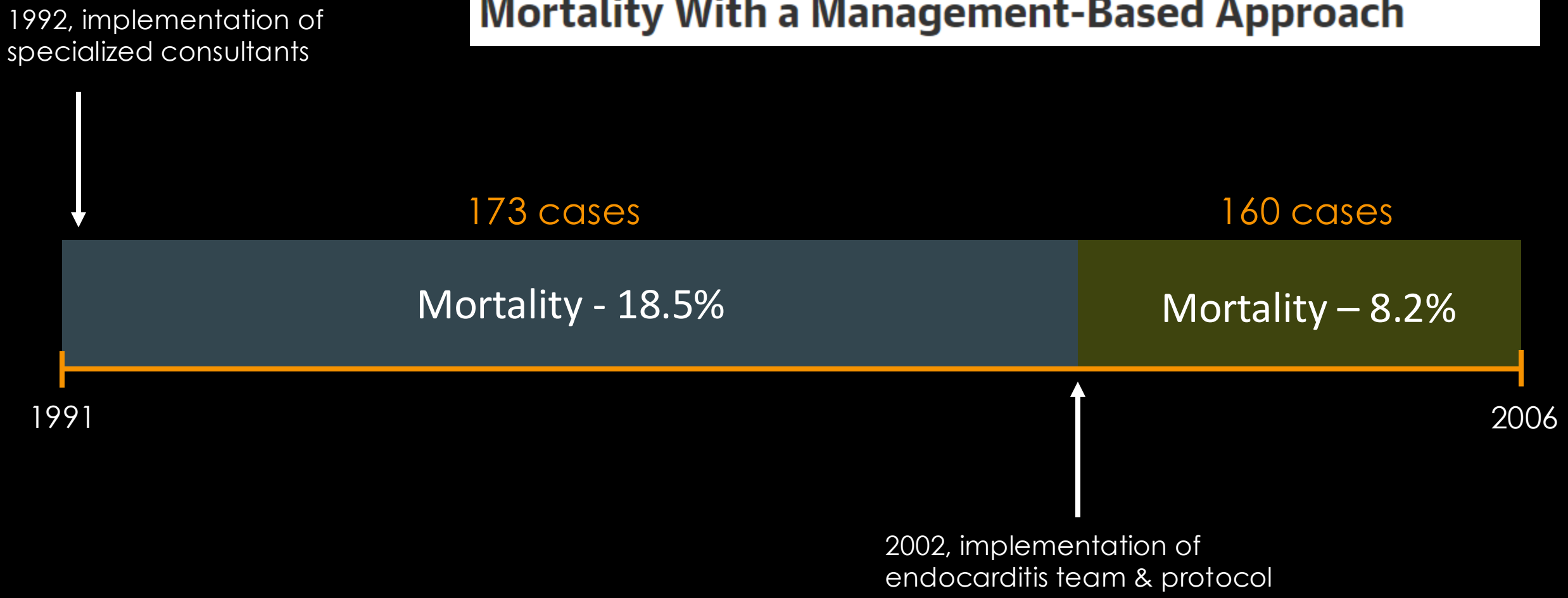
- 17 patients (25%) without a documented cardiac surgery consult
  - In-hospital mortality for these patients: 47.1%
- 51 patients with documented cardiac surgery consultation
  - 26 patients managed medically
    - In-hospital mortality: 38.5%, 2-year mortality 65.4%
  - 25 patients underwent surgery
    - In-hospital mortality: 8% ; **p = 0.01**, 2-year mortality 20% ; **p = 0.001**
    - Mean time to consult from admission: 7.1 days
    - Mean time to surgery from consult: 7.3 days

System Failure

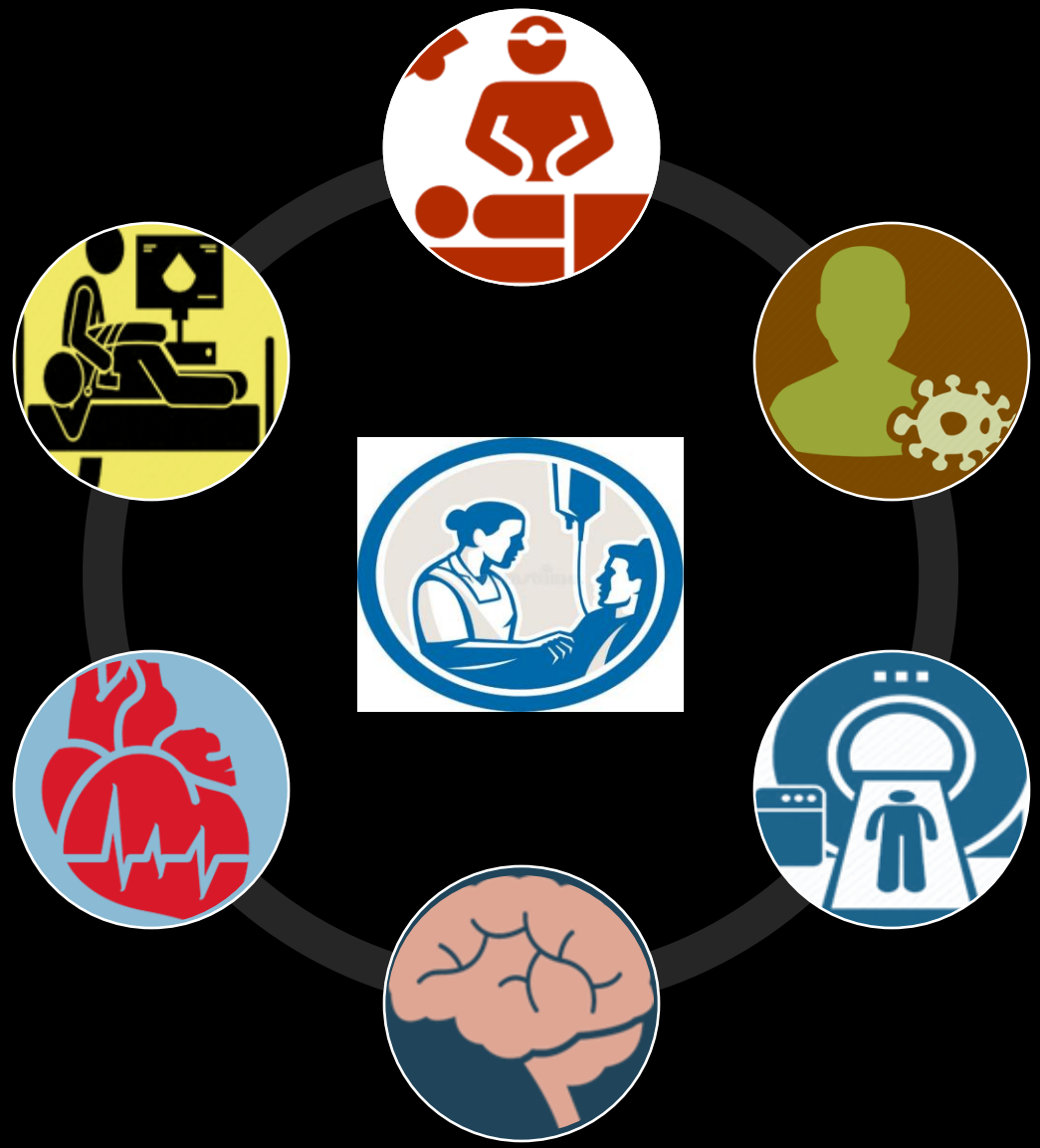
How can we do better?


Transfer Delay
Delayed diagnosis at OSH
Bed shortage at MM
Patient acuity not accurately conveyed via telephone
Patient transferred to general medicine rather than cardiology or CT surgery
Delayed/No Surgical Eval
Primary team does not recognize surgical indication
Patient felt to be poor surgical candidate
Patient felt to be improving
Mid-level communication
Curbside rather than formal consult
Surgery Not Offered
High peri-operative mortality
Intravenous drug use
Complexity of surgery/surgeon experience
Lack of communication between ID and CT surgery
Increase in Mortality
Culture negative/atypical cases
TTE not ordered for suspicious organism
Difficulty obtaining/reliance on TEE
Inexperience of admitting team
Incomplete transfer records
Delayed Diagnosis
Patient not seen <24 hours after consult
Additional/repeat testing requested
OR availability
OR staff availability
Busy surgical service
Delayed Surgery
Surgical follow-up felt unnecessary or scheduled too far out
Cardiology not involved in case
ID follow-up only occurs at completion of antibiotics
Distance to Michigan Medicine
Patient receives primary medical care elsewhere
Lack of Follow-up

Dramatic Reduction in Infective Endocarditis-Related Mortality With a Management-Based Approach



Botellho-Nevers et al. Arch Intern Med. 2009.



2015 ESC Endocarditis Guideline

Role of the 'Endocarditis Team'

1. The 'Endocarditis Team' should have meetings on a regular basis in order to discuss cases, take surgical decisions, and define the type of follow-up.
2. The 'Endocarditis Team' chooses the type, duration, and mode of follow up of antibiotic therapy, according to a standardized protocol, following the current guidelines.
3. The 'Endocarditis Team' should participate in national or international registries, publicly report the mortality and morbidity of their centre, and be involved in a quality improvement programme, as well as in a patient education programme.
4. The follow-up should be organized on an outpatient visit basis at a frequency depending on the patient's clinical status (ideally at 1, 3, 6, and 12 months after hospital discharge, since the majority of events occur during this period[57]).

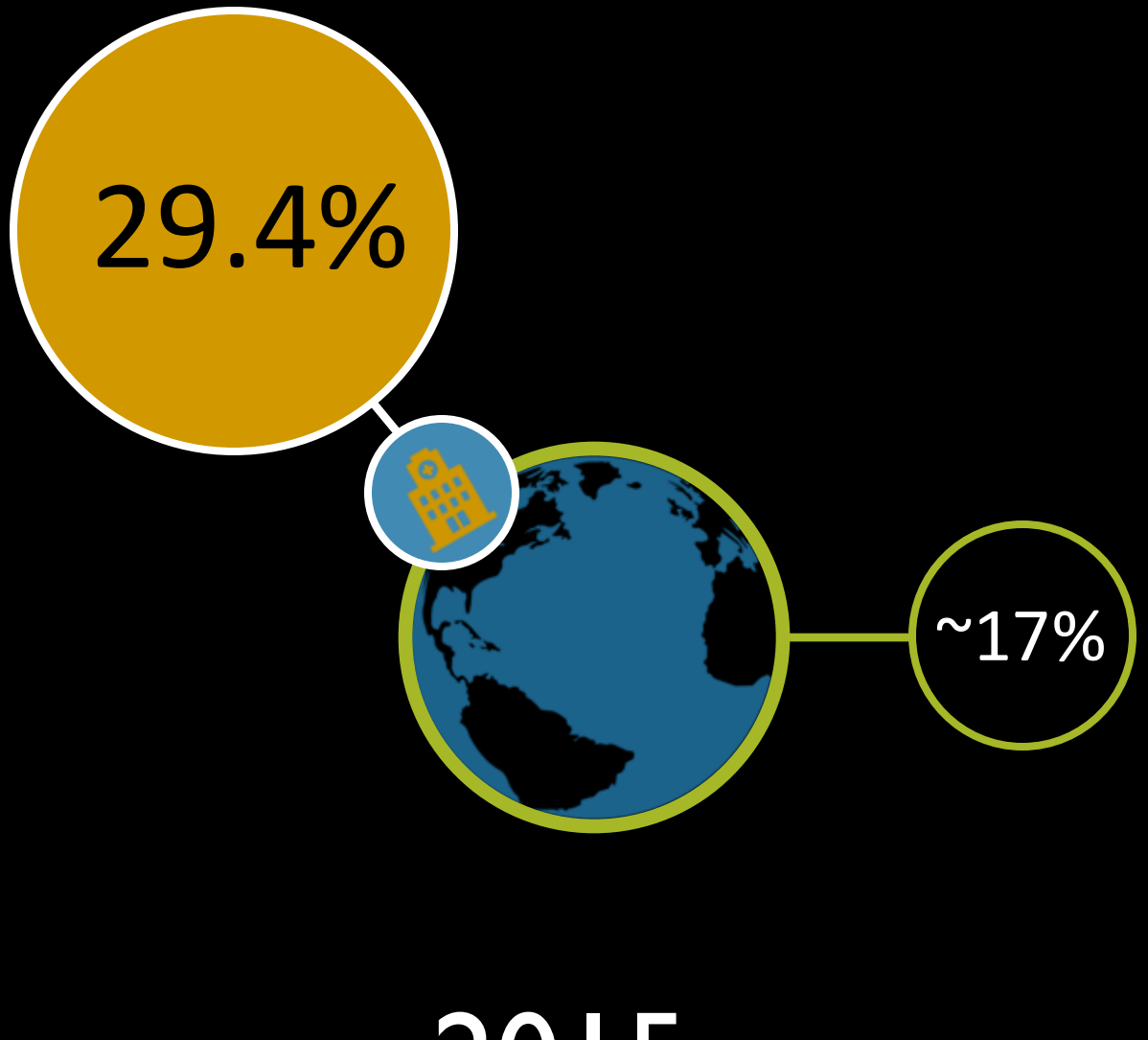
Multidisciplinary Endocarditis Team

- Implemented June 14, 2018
  - 3 Infectious Diseases Specialists
  - 2 Cardiac Surgeons
  - 2 Cardiologists
  - 1 Stroke Neurologist
  - 1 Cardiac Surgery PA
  - 1 ID Pharmacist
    - Institutional Protocol Developed
    - Best Practice Advisory created in Epic encouraging cardiac surgery consultation for endocarditis patients
    - Documented team recommendations with notes in the electronic medical record

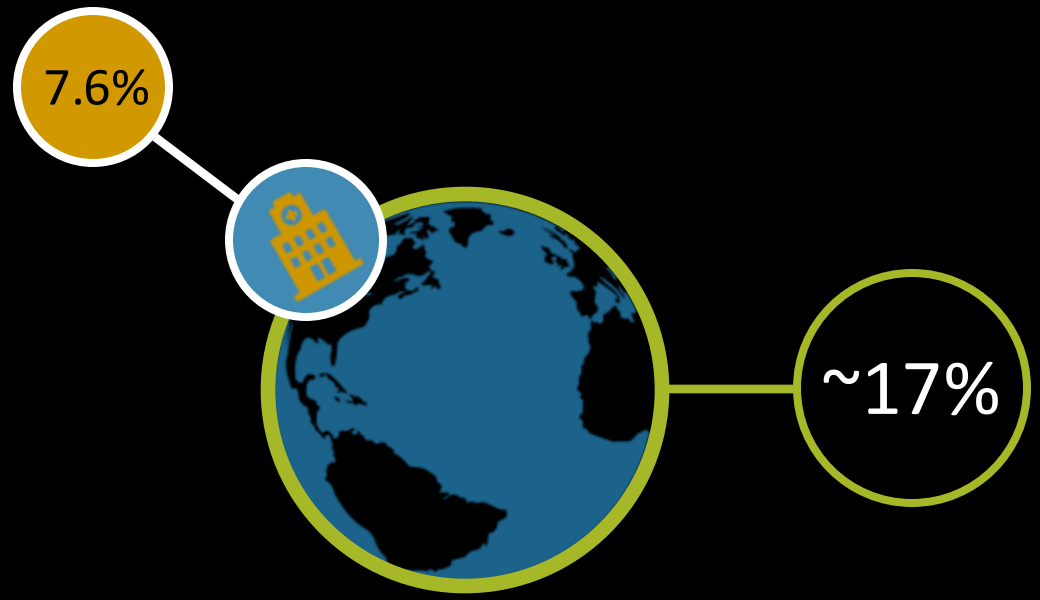
Multidisciplinary Endocarditis Team

- Implemented June 14, 2018
  - As of June 13, 2019
    - 119 discussed cases

Infective Endocarditis Mortality



2015



2019

Definite Endocarditis with Surgical Indication Outcomes

Variable	2014 - 2015	2018-2019	P-Value
Definite IE and Surgical Indications (n)	68	56	
Inpatient Mortality (%, n)	29.4	7.1 (4)	<0.0001

Definite Endocarditis with Surgical Indication Outcomes

Variable	2014 - 2015	2018-2019	P-Value
Definite IE and Surgical Indications (n)	68	56	
Inpatient Mortality (%, n)	29.4	7.1 (4)	<0.0001
Surgery Performed (%)	41	55.4	0.12
Average time from admission to surgery (days)	14	11.4	0.29

Definite Endocarditis with Surgical Indication Outcomes

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Inpatient Mortality (%, n)	29.4	7.1 (4)	<0.0001
Surgery Performed (%)	41	55.4	0.12
Average time from admission to surgery (days)	14	11.4	0.29
Average length of hospital stay prior to Cardiac Surgery consult (days)	7.1	2	<0.0001

Definite Endocarditis with Surgical Indication Outcomes

Mortality	2014-2015 (n=68)	2018-2019 (n=56)	P-Value
Overall, % (n)	29.4 (20)	7.1 (4)	<0.0001
Medical Management, % (n)	45 (18)	16 (4)	0.02
Surgical Management, % (n)	7.1 (2)	0 (0)	0.13

Surgery for Active Endocarditis

Academic Year	Active Endocarditis Surgical Cases
Annual Average (2014-2018)	35.75
2018-2019	52

Multidisciplinary Endocarditis Team

The Clinical Impact of Implementation of a Multidisciplinary Endocarditis Team

Sami El-Dalati, MD • Daniel Cronin, MD • James Riddell IV, MD • ... Matthew Romano, MD • Bo Yang, MD, PhD • George Michael Deeb, MD • Show all authors

Multidisciplinary Teams – Meta Analysis

Open Forum Infectious Diseases
IDSA Infectious Diseases Society of America

Multidisciplinary Teams for the Management of Infective Endocarditis: A Systematic Review and Meta-analysis

Anne-Sophie Roy, Hamila Hagh-Doust, Ahmed Abdul Azim, Juan Caceres, Justin T Denholm, Mei Qin (Denise) Dong, Madeline King, Christina F Yen, Todd C Lee, Emily G McDonald ✉ Author Notes

- 18 total studies, 15 studies included in the meta-analysis
  - Meta-analysis resulted in a risk ratio of 0.61 (95% CI, .47–.78; I^2 = 62%) for mortality in favor of a dedicated multidisciplinary team as compared with usual care
  - 16/18 studies (88.9%) reported a decreased time to surgery
  - 13/18 studies (72.2%) reported increased rate of surgery
  - Further research is needed to evaluate benefits of virtual MDT care, cost-effectiveness, and the impact on patient-reported outcomes and long-term mortality

2023 European Society of Cardiology Endocarditis Guideline

European Heart Journal

2023 ESC Guidelines for the management of endocarditis: Developed by the task force on the management of endocarditis of the European Society of Cardiology (ESC) *Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS) and the European Association of Nuclear Medicine (EANM)*

Multidisciplinary Endocarditis Teams

Recommendations	Class[a]	Level[b]
Diagnosis and management of patients with complicated IE are recommended to be performed at an early stage in a Heart Valve Centre, with immediate surgical facilities and an 'Endocarditis Team' to improve the outcomes.[36–41,122,123,125,126]	I	B
For patients with uncomplicated IE managed in a Referring Centre, early and regular communication between the local and the Heart Valve Centre endocarditis teams is recommended to improve the outcomes of the patients.[36–41,122,123,125,126]	I	B

IE, infective endocarditis.
[a]Class of recommendation.
[b]Level of evidence.

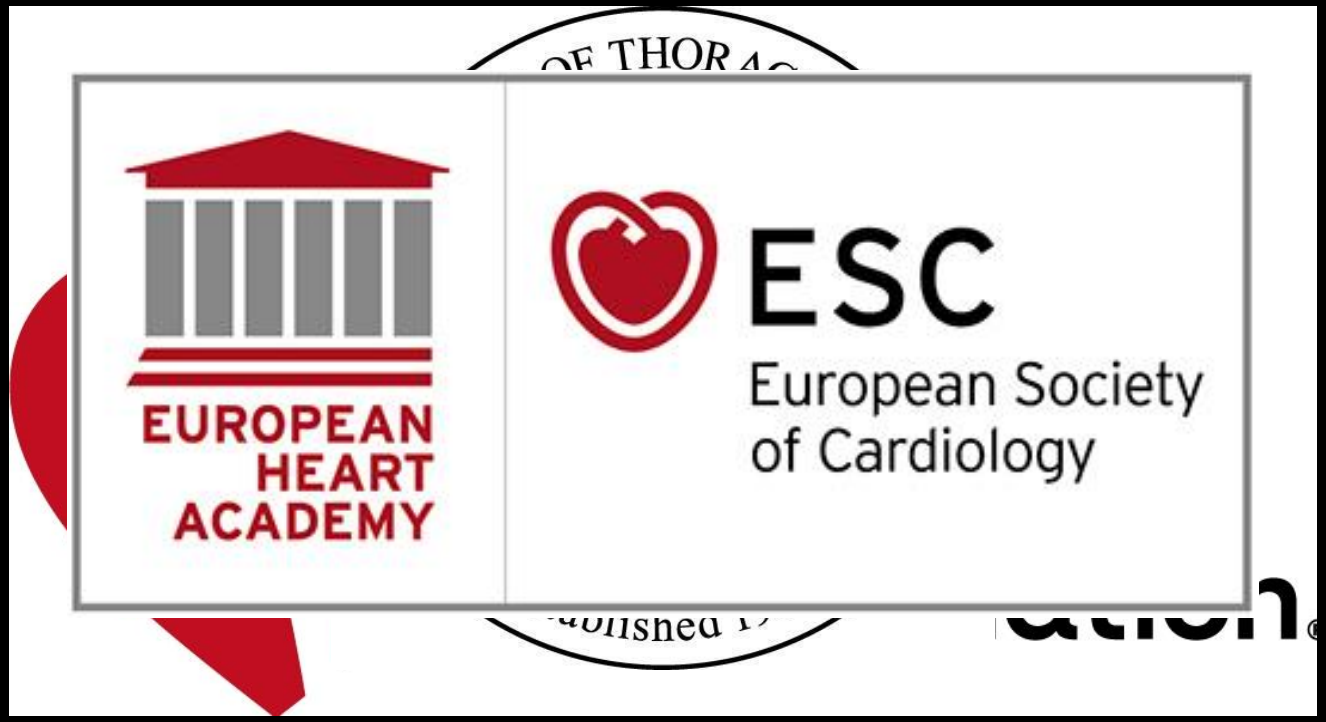
Multidisciplinary Endocarditis Teams

Table 7

Members of the Endocarditis Team

	Heart Valve Centre
Core members	• Cardiologists. • Cardiac imaging experts. • Cardiovascular surgeons. • Infectious disease specialist (or internal medicine specialist with expertise in infectious diseases) • Microbiologist. • Specialist in outpatient parenteral antibiotic treatment.
Adjunct specialities	• Radiologist and nuclear medicine specialist. • Pharmacologist. • Neurologist and neurosurgeon. • Nephrologist. • Anaesthesiologists. • Critical care. • Multidisciplinary addiction medicine teams. • Geriatricians. • Social worker. • Nurses. • Pathologist.

Multidisciplinary Endocarditis Teams



UK Endocarditis Team

Epidemiology - Infective Endocarditis at UK

- 2009 – 2018

Variable (N, %)	Overall (n = 1,255)	P1 (n = 86)	P2 (n = 144)	P3 (n = 190)	P4 (n = 330)	P5 (n = 505)	P-value
Infective endocarditis admissions (% overall admissions)	0.35	**0.13**	0.21	0.27	0.44	**0.62**	< .001
Intravenous drug use	826 (65.8)	**33 (38.4)**	84 (58.3)	86 (45.3)	252 (76.4)	**371 (73.5)**	< .001

Epidemiology - Infective Endocarditis at UK

- 2009 – 2018

Variable (N, %)	Overall (n = 1,255)	2009-2010 (n = 86)	2011-2012 (n = 144)	2013-2014 (n = 190)	2015-2016 (n = 330)	2017-2018 (n = 505)	P-value
Valve involvement							
Left sided	663 (52.8)	59 (68.6)	90 (62.5)	125 (65.8)	166 (50.3)	223 (44.2)	.002
Isolated tricuspid valve	432 (34.4)	**23 (26.7)**	39 (27)	43 (22.6)	118 (35.6)	**209 (41.4)**	.05
Multi-valve	165 (13.2)	17 (19.8)	21 (14.6)	36 (18.9)	31 (9.4)	60 (11.9)	.008

UK Endocarditis Team

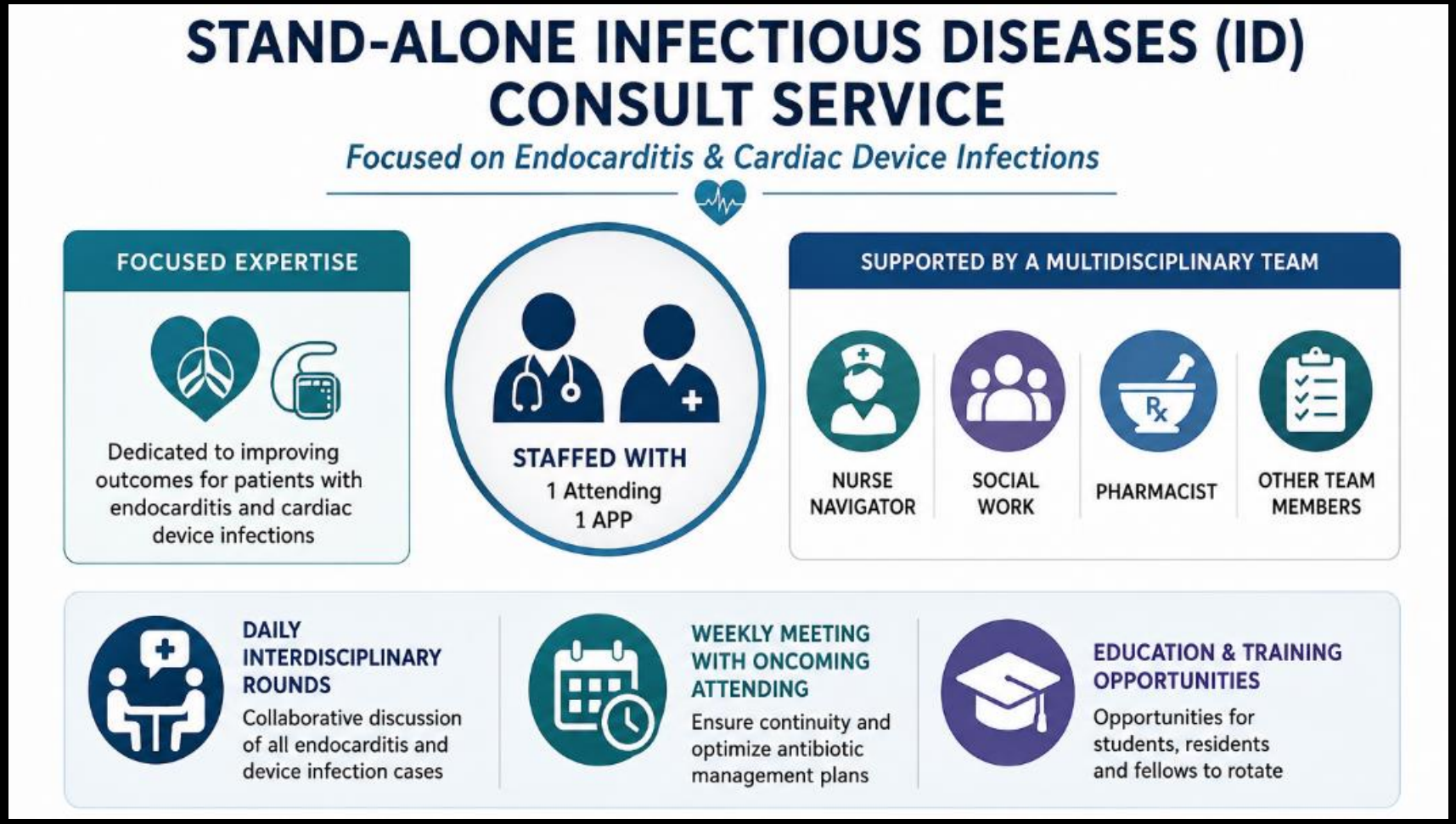
UK Endocarditis Team

- Multidisciplinary team comprised of:
  - Cardiac Surgery
  - Cardiology
  - ACES
  - Infectious Diseases
  - Neurology
  - Neurosurgery
  - Palliative Care
  - Pharmacy
  - PM&R
  - Ethics
  - Social work

UK Endocarditis Team

- First meetings in July 2021 with case presentations starting September 2021
- Meet weekly on Wednesdays from 4-5 PM via Zoom
- Discuss all UK inpatients admitted with endocarditis
  - 873 patients since September 2021

UK Endocarditis ID Consult Service



UK Endocarditis Team

- Nurse Navigator – Deb Gill
  - Arranges follow-up appointments
  - Calls patients within 48 hours of discharge
  - Point of contact for patients after discharge
  - Calls patients for appointment reminders
  - Coordinates outpatient testing
  - Interfaces with nursing and support staff from other specialties
  - Works with pharmacist and specialty pharmacy to coordinate hepatitis C treatment

UK Endocarditis Team

- Pharmacist - Will Harris
  - Assists with selection and dosing of antibiotic regimens
  - Reviews laboratory studies and adjusts antibiotics for OPAT patients
  - Development of oral antibiotic protocol
  - Assists with prior authorizations for oral antibiotics/long-acting glycopeptides
  - Works with nurse navigator to coordinate hepatitis C treatment

UK Endocarditis Team

- WRAP Program
  - Grant funded initiative that provides case management, transportation assistance and substance use treatment for patients with infections related to substance use disorders
  - Assists with transportation resources for non-SUD patients

UK Endocarditis Team

- Multidisciplinary Outpatient Clinic
  - ID/Cardiac Surgery
  - Held one-half day per month (3rd Friday of the month)
  - Allows patients to see both providers at once
    - ID resources can be used to ensure transportation
  - Primary clinic for complex endocarditis patients requiring outpatient surgical evaluation

UK Endocarditis Team

- Outreach Clinic
  - Infectious Diseases Clinic held once per month in Hazard, KY
  - Located at the UK North Fork Valley Family Medicine Clinic
  - 1st clinic held on February 12th, 2024

UK Endocarditis Team

- Regional Outreach
  - Endocarditis Virtual Summit – 4 hour virtual conference
    - Held three times in 2022, 2024, and 2025
    - Speakers from ID, cardiology, cardiac surgery, addiction medicine and neurology

University of Kentucky Endocarditis Team

Variable	2017-2018	2021-2026	P-Value
Endocarditis Patients, n	505	826	
Inpatient Mortality, % (n)	17.4 (88)	9.2 (76)	<0.0001
Surgery Performed, % (n)	11.7 (59)	19.7 (163)	0.0002
Median Length of Stay (days)	25	16	


I Can't Believe
It's Not
Intravenous!
®

Background

- Incidence of 22 per 100,000 adults in 2016
  - > 54,000 cases in U.S. in 2016

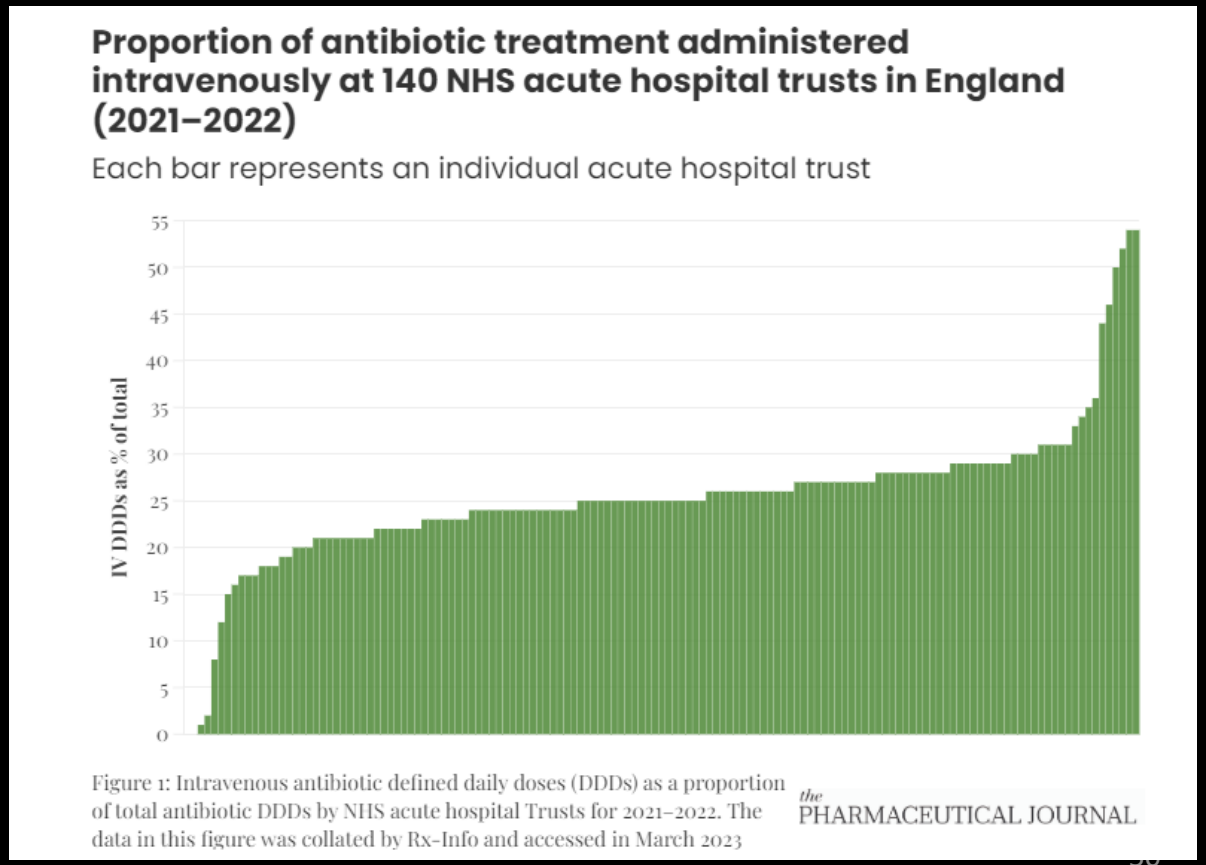
- Inflation-adjusted expenditure in infective endocarditis hospitalizations
  - $1.56 billion in 2003 to $2.34 billion to 2016

- 250,000 individuals in the US may die of IE between 2020 – 2030

JAMA Netw Open. 2022;5(2):e220541
MayoClinProc.2020;95(5):858-866

Traditional Thinking

- Infections requiring long term IV antimicrobial therapy
  - Infective Endocarditis
  - Osteomyelitis
  - Deep Seated Infections
  - Abscesses
  - Complicated Bacteremias

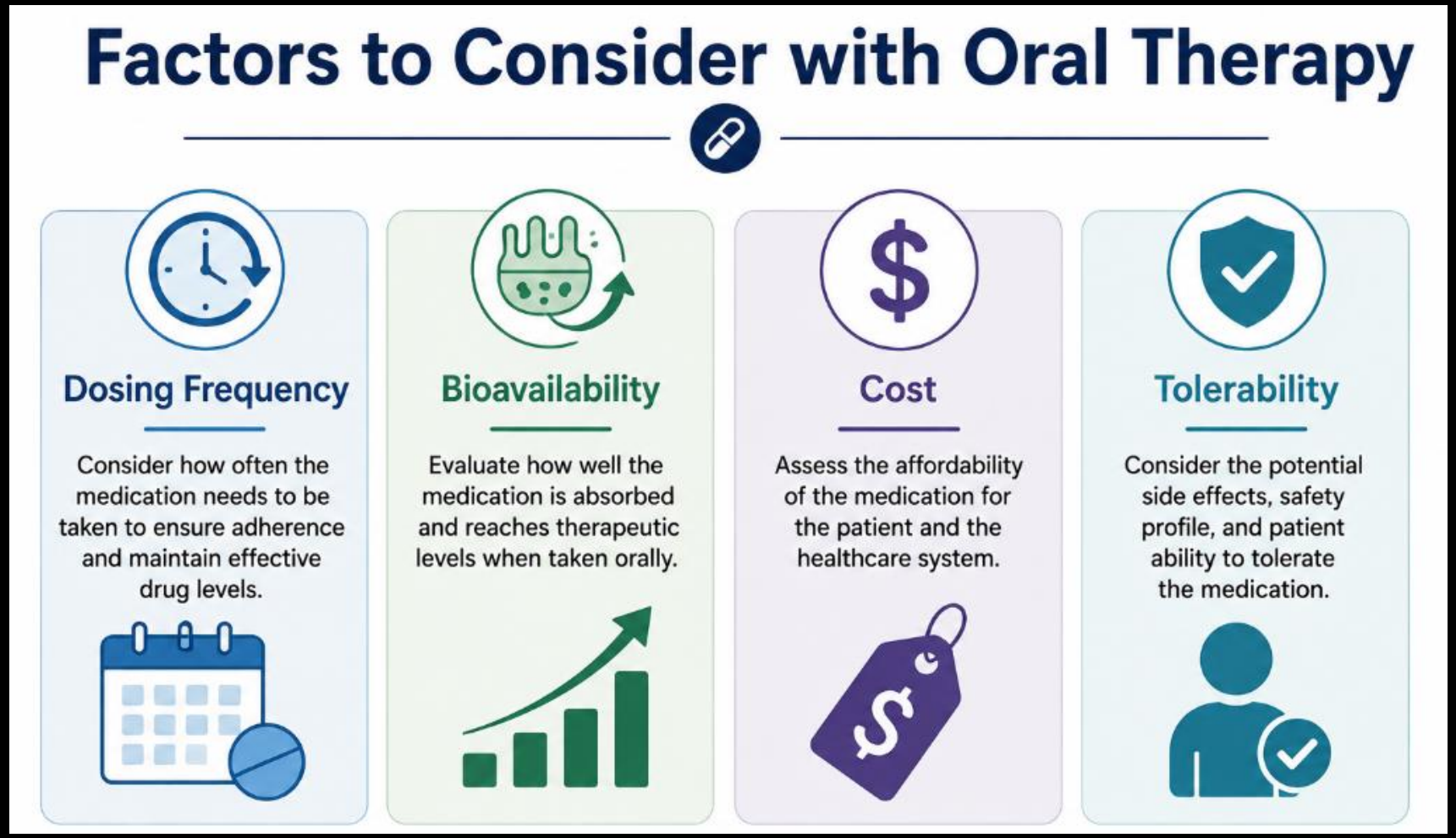


https://pharmaceutical-journal.com/article/ld/switching-patients-from-iv-to-oral-antimicrobials

The New Way?


Advantages of Oral Therapy
Decrease central line bloodstream infection (CLBSI)
Decrease in medication errors
Reduce length of stay
Save on nursing time
Lower associated costs (PICC/Dressing Changes/Labs)
Oral therapy improves patient safety, enhances experience, and optimizes resources while maintaining excellent clinical outcomes.

The New Way?


Factors to Consider with Oral Therapy
Dosing Frequency
Consider how often the medication needs to be taken to ensure adherence and maintain effective drug levels.
Bioavailability
Evaluate how well the medication is absorbed and reaches therapeutic levels when taken orally.
Cost
Assess the affordability of the medication for the patient and the healthcare system.
Tolerability
Consider the potential side effects, safety profile, and patient ability to tolerate the medication.

Historical Background

Review

March 30, 2020

Evaluation of a Paradigm Shift From Intravenous Antibiotics to Oral Step-Down Therapy for the Treatment of Infective Endocarditis

A Narrative Review

Brad Spellberg, MD[1]; Henry F. Chambers, MD[2]; Daniel M. Musher, MD[3]; et al

» Author Affiliations | Article Information

JAMA Intern Med. 2020;180(5):769-777. doi:10.1001/jamainternmed.2020.0555

Historical Background

- Prior to the introduction of penicillin in the 1940s, mortality was ~99%
- With the introduction of intravenous penicillin mortality rates fell to ~15%
- Oral formulations of early tetracycline, macrolide and sulfa antibiotics are unable to achieve adequate tissue levels required to kill many bacteria that cause

Table 1. Peak Blood Levels vs MICs Achieved by Antibiotics Used to Treat Infective Endocarditis in Published Studies

Oral drug	Peak blood level, μg/mL[a]	MIC_{90}, μg/mL[b]	Peak blood level to MIC_{90} ratio
Antibiotics with peak blood level to MIC_{90} ratio ≤1			
Tetracycline, 250 mg	1	≥4	0.125
Erythromycin, 500 mg	0.5	≥4	0.125
Sulfanilamide, 4000 mg[5-9]	50	50-70	0.8

Historical Background

- Newer oral antibiotic agents are more available, are better able to generate higher tissues concentrations required to effectively kill bacteria causing endocarditis

Oral drug	Peak blood level, μg/mL[a]	MIC_{90}, μg/mL[b]	Peak blood level to MIC_{90} ratio
Antibiotics with peak blood level to MIC_{90} ratio >1			
Penicillin V, 500 mg, for *Streptococcus* spp	5	1	5
Amoxicillin, 1000 mg, for *Streptococcus* spp	10	1	10
Levofloxacin, 750 mg, for *Staphylococcus* spp	9	4	2.25
Moxifloxacin, 400 mg, for *Staphylococcus* or *Streptococcus* spp			
Staphylococcus aureus	4	4	1
Streptococcus spp	4	0.25	16
Rifampin, 600 mg, for gram-positive cocci	7	1	7
TMP-SMX, 320 mg/1600 mg, for *Staphylococcus* spp	100	4.75	22
Linezolid, 600 mg, for gram-positive cocci	15	2	7.5
Clindamycin, 600 mg, for *Staphylococcus* spp	10	2	5

Historical Background

RESEARCH ARTICLE | VOLUME 101, ISSUE 1, P68-76, JULY 1996

Oral antibiotic treatment of right-sided staphylococcal endocarditis in injection drug users: Prospective randomized comparison with parenteral therapy

- 93 patients with Staphylococcal IE (included possible IE cases)
  - 45 treated w/PO Ciprofloxacin and Rifampin twice daily
  - 48 treated w/IV Oxacillin or Vancomycin (plus gentamicin for the first 5 days)
  - 82 MSSA, 6 coag-negative Staphylococci, and 5 MRSA
- 1 PO treatment failure (5.2%) and 3 IV treatment failures (12.0%)
- Notably echocardiography was not required for participation in the study
- Vegetations only seen in 15/93 (16.1%) patients

Historical Background

Switch to oral antibiotics in the treatment of infective endocarditis is not associated with increased risk of mortality in non–severely ill patients

A. Mzabi • S. Kernéis • C. Richaud • I. Podglajen • M.-P. Fernandez-Gerlinger • J.-L. Mainardi

Open Archive • Published: April 15, 2016 • DOI: https://doi.org/10.1016/j.cmi.2016.04.003

- Retrospective study of 426 patients from 2000 – 2012
- 214 switched from IV to PO at a median of 21 days of therapy
- Mortality was lower (16% vs 36%) in patients treated with PO
- Numerically lower rates of relapsed/re-infection in patients treated with PO

Partial Oral Antibiotic Therapy for Endocarditis

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Partial Oral versus Intravenous Antibiotic Treatment of Endocarditis

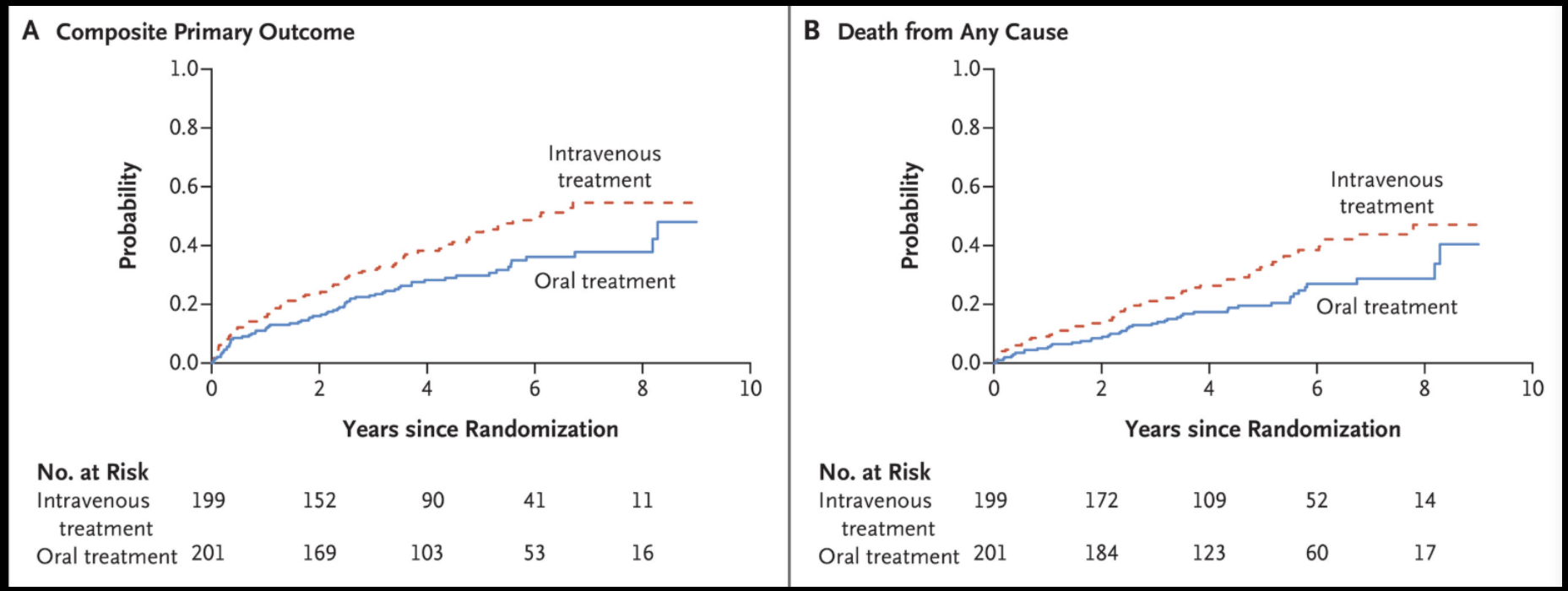
Kasper Iversen, M.D., D.M.Sc., Nikolaj Ihlemann, M.D., Ph.D., Sabine U. Gill, M.D., Ph.D., Trine Madsen, M.D., Ph.D., Hanne Elming, M.D., Ph.D., Kaare T. Jensen, M.D., Ph.D., Niels E. Bruun, M.D., D.M.Sc., Dan E. Høfsten, M.D., Ph.D., Kurt Fursted, M.D., D.M.Sc., Jens J. Christensen, M.D., D.M.Sc., Martin Schultz, M.D., Christine F. Klein, M.D., et al.

Partial Oral Antibiotic Therapy for Endocarditis

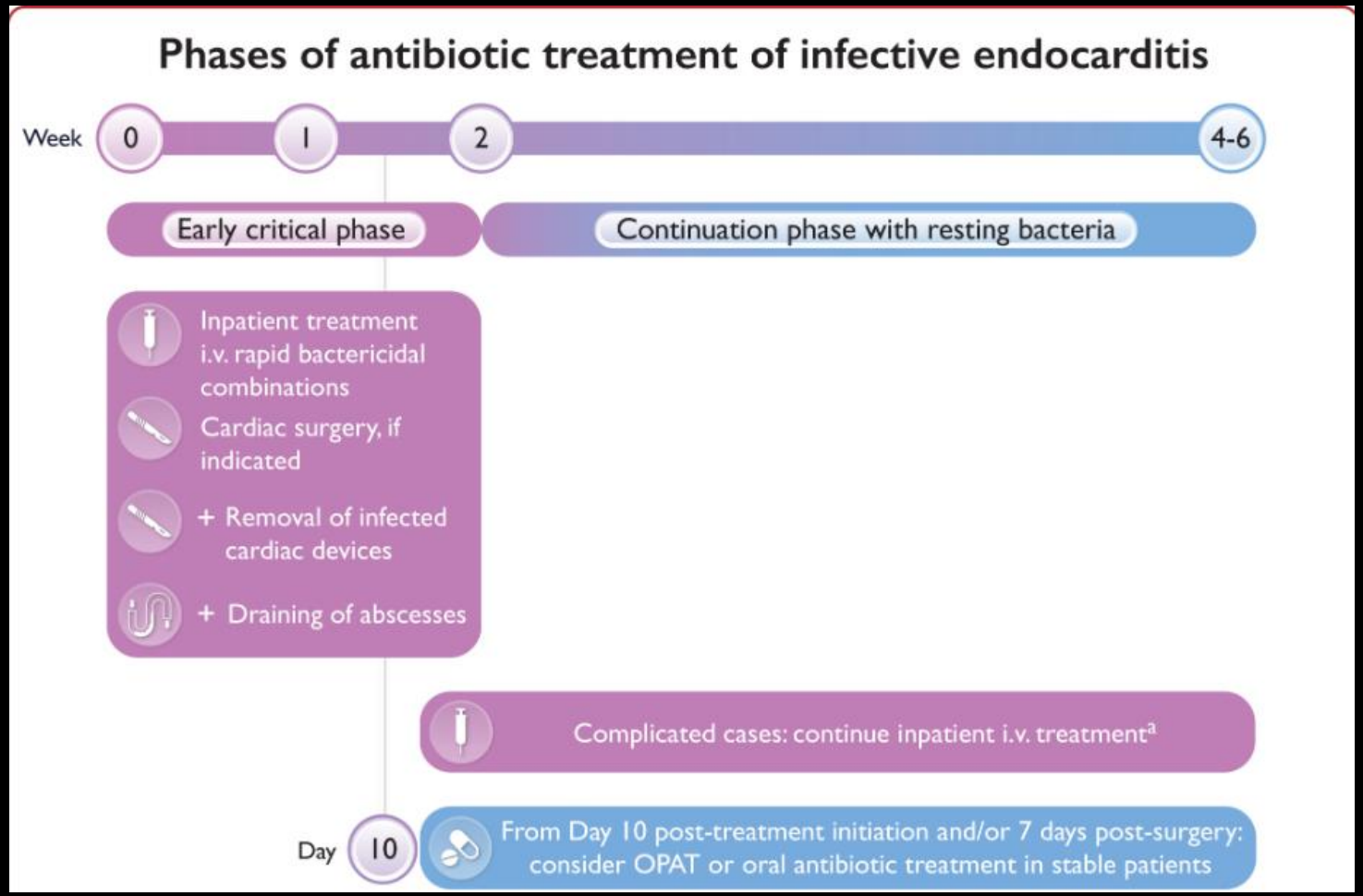
- Randomized controlled trial of 400 patients with left-sided endocarditis
  - 201 patients received oral therapy
  - 199 received IV therapy
- All patients received at least 10 days of IV therapy before transitioning to PO
- Studied organisms
  - **MSSA**
  - CONS
  - Streptococci
  - Enterococcus faecalis
- Primary outcome was composite of all-cause mortality, unplanned cardiac surgery, embolic events or relapse of bacteremia with the primary pathogen for up to 6 months
- Primary outcome occurred in 12.1% in the IV group and 9.0% in the PO group – meeting non-inferiority criteria

Partial Oral Antibiotic Therapy for Endocarditis

Five-Year Outcomes of the Partial Oral Treatment of Endocarditis (POET) Trial

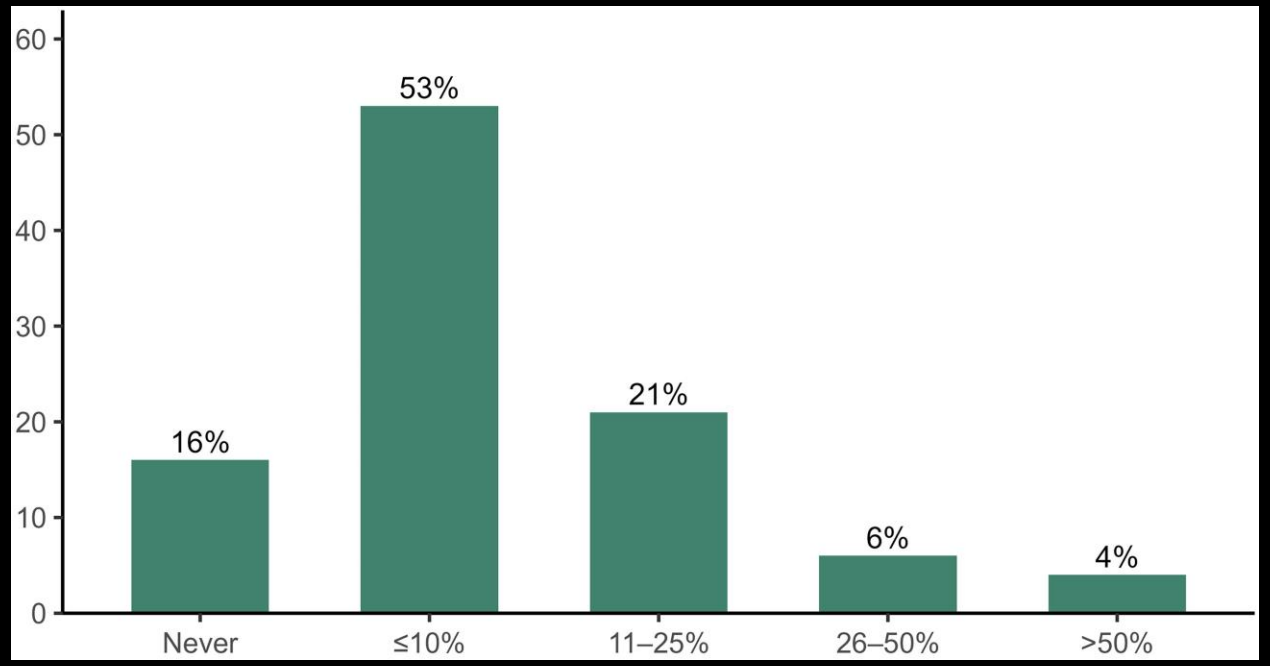


2023 European Society of Cardiology Endocarditis Guideline



Partial Oral Antibiotic Therapy for Endocarditis

- Frequency of partial oral therapy for infective endocarditis management.
  - Survey of 452 ID physicians

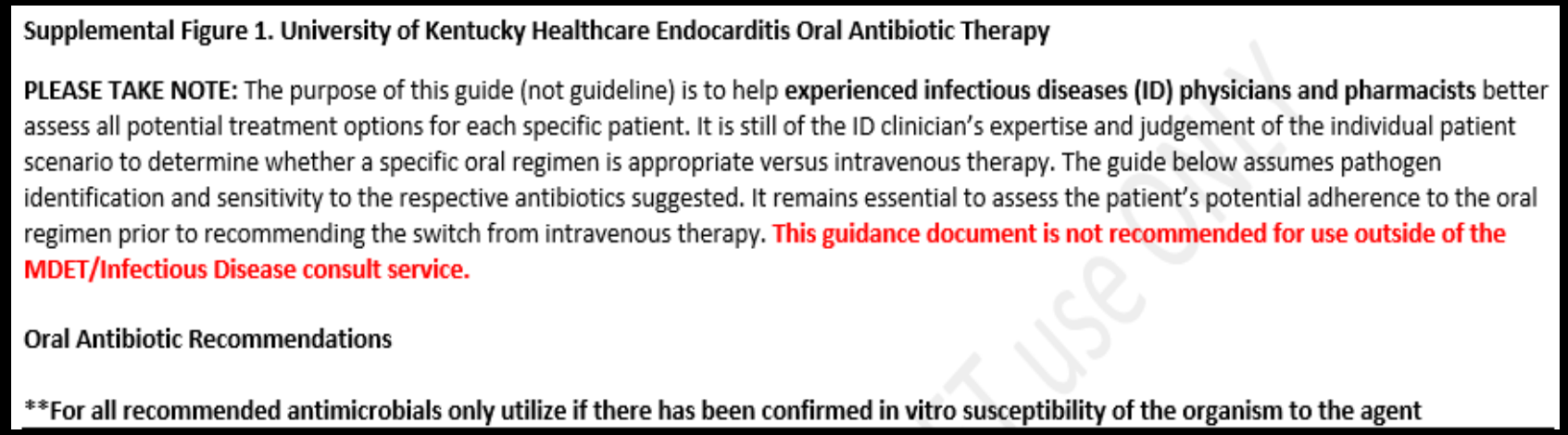


Open Forum Infect Dis, Volume 12, Issue 9, September 2025, ofaf580, https://doi.org/10.1093/ofid/ofaf580

Oral Antibiotic Therapy for Endocarditis at UK

Oral Antibiotic Therapy for Endocarditis at UK

- In September 2021, the UK Endocarditis ID consult service developed an internal protocol for transition to oral antibiotic therapy in patients with endocarditis
  - Adapted from the POET trial antibiotic protocol



Supplemental Figure 1. University of Kentucky Healthcare Endocarditis Oral Antibiotic Therapy

PLEASE TAKE NOTE: The purpose of this guide (not guideline) is to help **experienced infectious diseases (ID) physicians and pharmacists** better assess all potential treatment options for each specific patient. It is still of the ID clinician's expertise and judgement of the individual patient scenario to determine whether a specific oral regimen is appropriate versus intravenous therapy. The guide below assumes pathogen identification and sensitivity to the respective antibiotics suggested. It remains essential to assess the patient's potential adherence to the oral regimen prior to recommending the switch from intravenous therapy. **This guidance document is not recommended for use outside of the MDET/Infectious Disease consult service.**

Oral Antibiotic Recommendations

****For all recommended antimicrobials only utilize if there has been confirmed in vitro susceptibility of the organism to the agent**

Oral Antibiotic Therapy for Endocarditis at UK

- Protocol emphasizes treatment for MSSA, methicillin susceptible Staphylococci, *Enterococcus Faecalis,* and Streptococci

Highly penicillin susceptible viridans group streptococci (VGS), *Streptococcus gallolyticus (bovis)*, other streptococci with an MIC to penicillin ≤ 0.12mcg/ml	Endocarditis (Native and Prosthetic Valve)	Amoxicillin 1 g Q6H AND Linezolid[1] 600 mg Q12H OR Linezolid[1] 600 mg Q12H AND Levofloxacin[3] 750 mg Q24H Duration: Refer to UK guidelines	Consider in the following patients: - Completed ≥ 10 days of IV antibiotic therapy from the 1st negative blood culture - Completed ≥ 7 days of IV antibiotic therapy from the operative date (if surgically managed) - Afebrile >48 hours - WBC count <15,000 - CRP <2.0 mg/dL (ref range <0.8) or 25% of value at diagnosis - BMI <40 - Can tolerate PO therapy *Substitute Cefadroxil 1 gm twice a day for amoxicillin in penicillin allergic patients

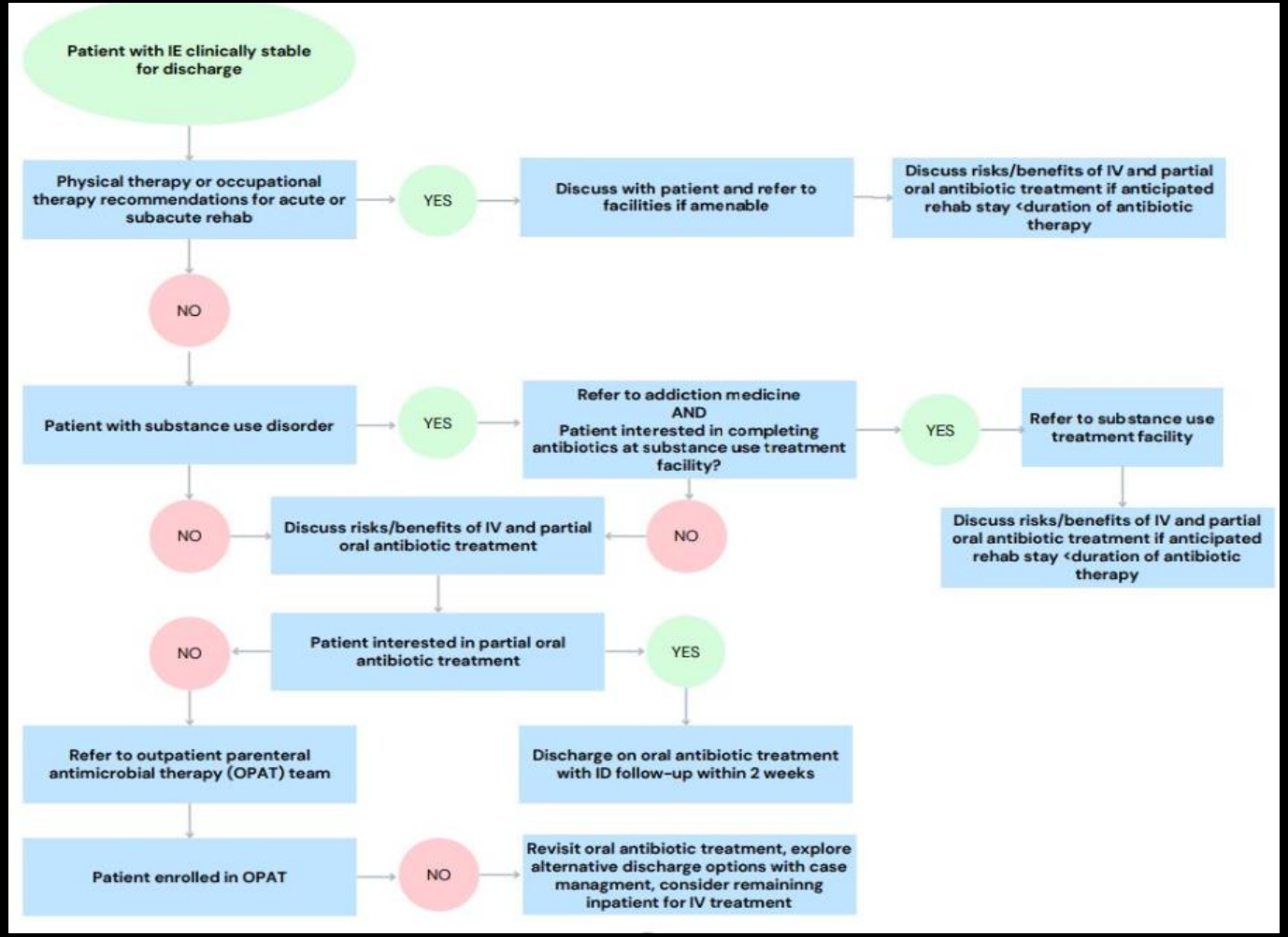
Oral Antibiotic Therapy for Endocarditis at UK

- Recommendations for laboratory monitoring with specific antimicrobials

Antimicrobial Monitoring and Drug Interactions

Antibiotic	Lab Monitoring	Renal Dosing Adjustment	Drug-Drug Interactions
Cefadroxil	Not routinely indicated, consider CBC and CMP every 2 weeks	Yes	N/A
Dicloxacillin	Not routinely indicated, consider CBC and CMP every 2 weeks	No	N/A
Levofloxacin	Every 1-2 weeks serum BUN, creatinine	No	Use with caution with other QT prolonging medications Examples: methadone, amiodarone, macrolides, azole antifungal, SSRIs, antipsychotics
Linezolid	Weekly CBC with differential for courses >14 days	No (Use with renal impairment may increase the risk of thrombocytopenia)	Use with caution in patients on concurrent methadone or other serotonergic medications as they may enhance the serotonergic effect of Linezolid and could result in serotonin syndrome.
Rifampin	LFTs every 2 weeks	No	Potent CYP3A4 inducer which may result in decreased drug concentration of concurrently prescribed medications Examples: Methadone, Warfarin, DOACs, azole antifungals, ticagrelor

Oral Antibiotic Therapy for Endocarditis at UK



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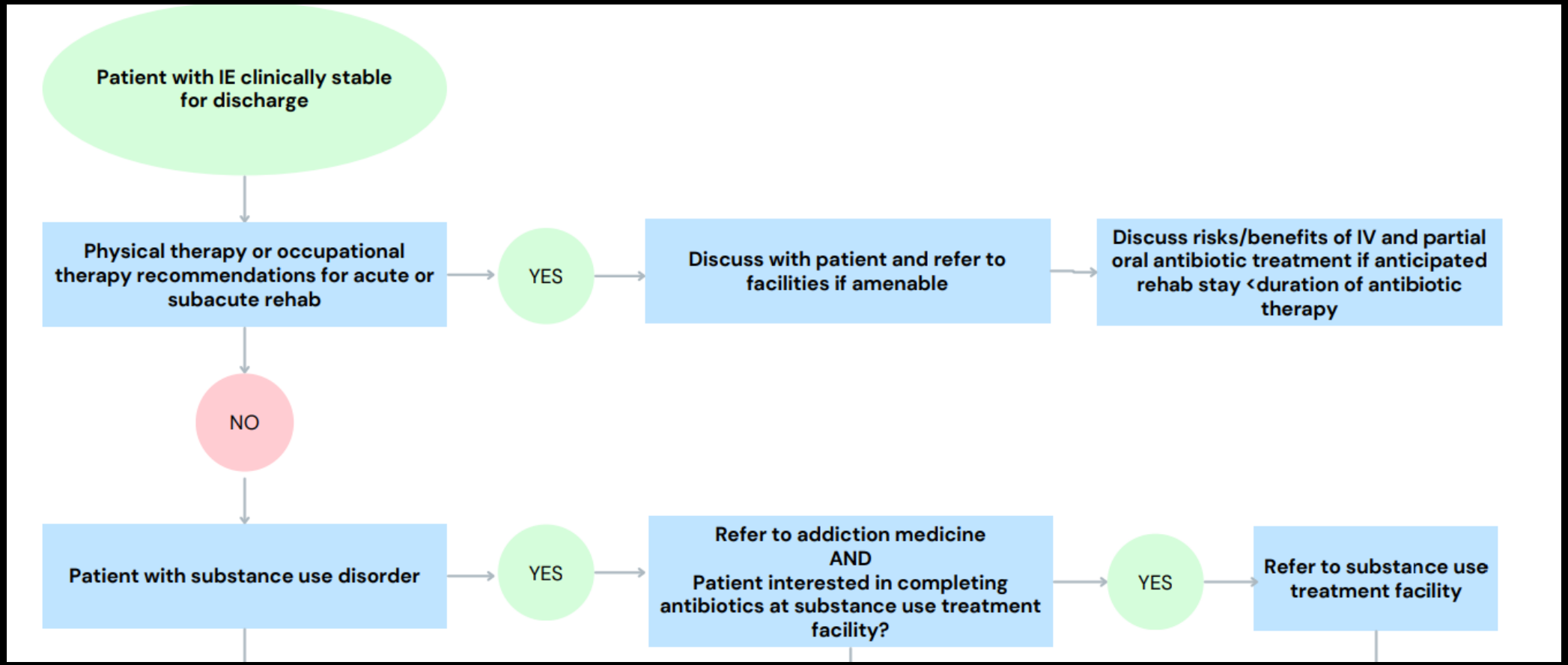

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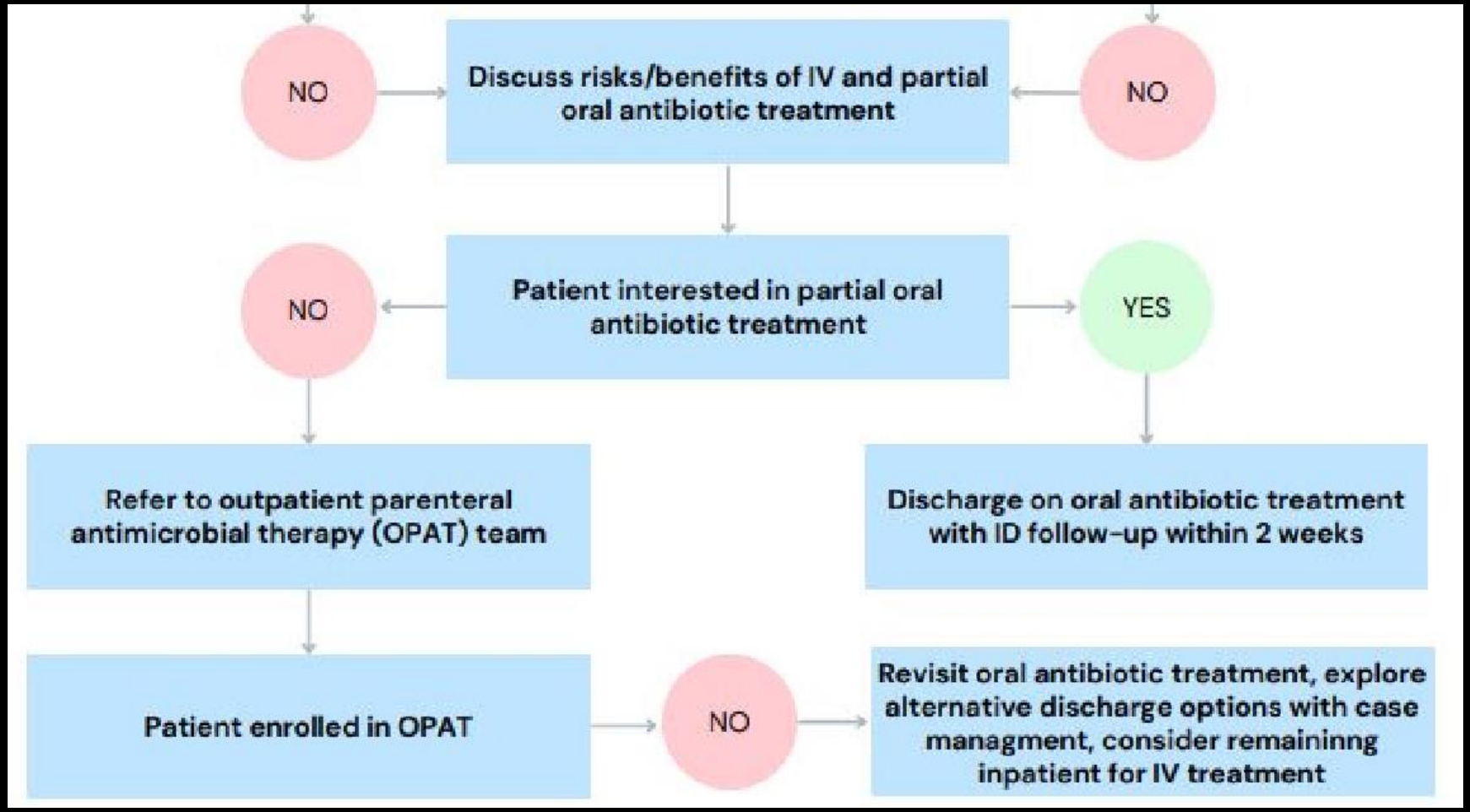
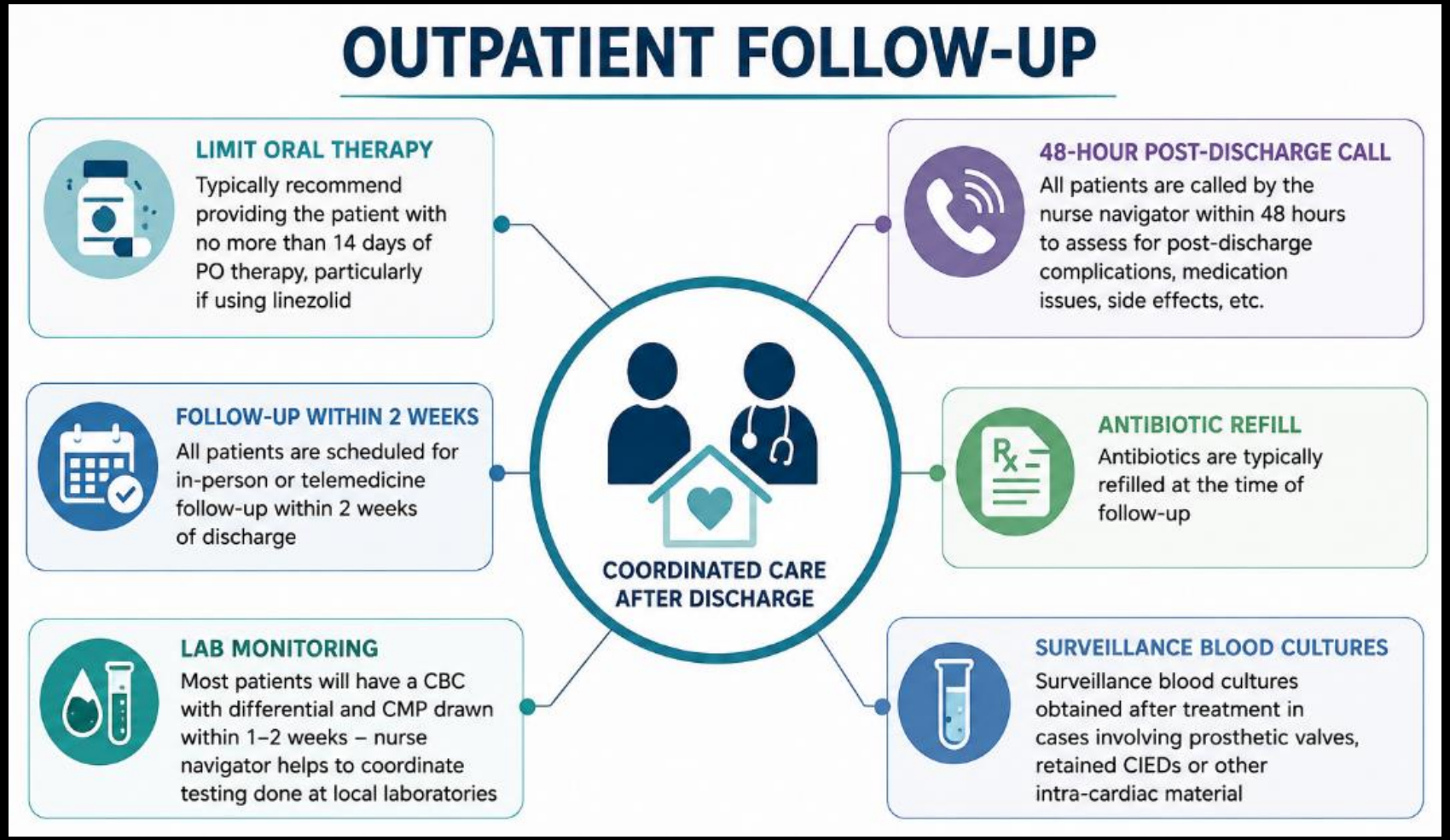
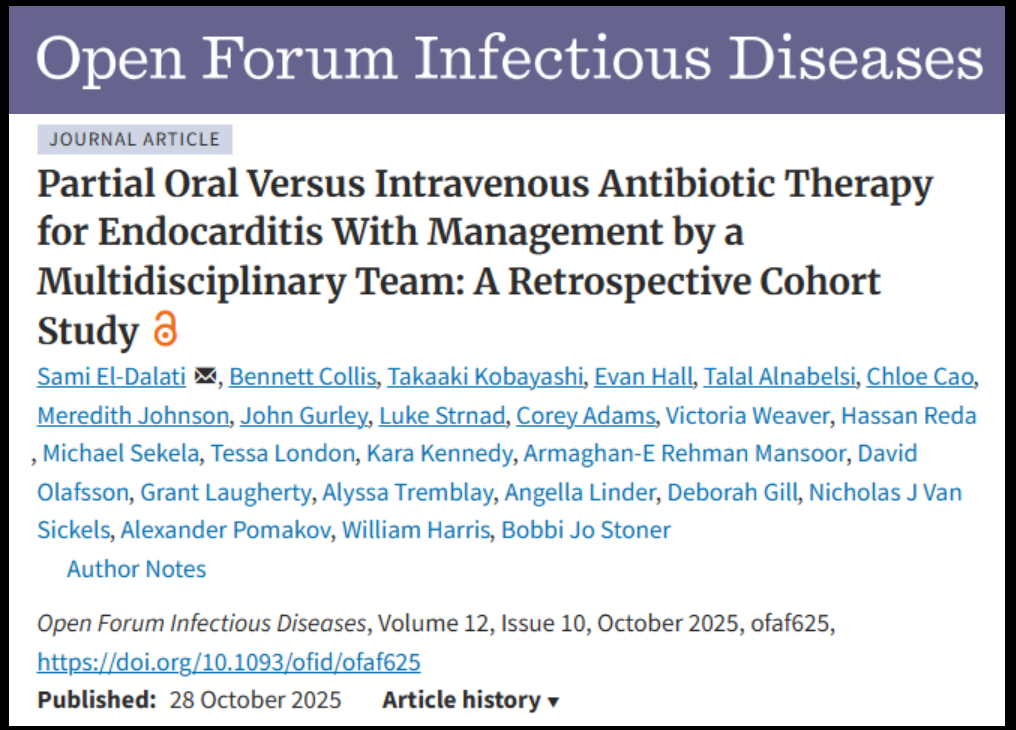


Oral Antibiotic Therapy for Endocarditis at UK



Oral Antibiotic Therapy for Endocarditis at UK

- 4-Year Review of PO therapy outcomes with IV control group
  - Single-center retrospective study of patients with definite IE identified from UK institutional registry between September 7, 2021, and March 1, 2025



Open Forum Infectious Diseases

JOURNAL ARTICLE

Partial Oral Versus Intravenous Antibiotic Therapy for Endocarditis With Management by a Multidisciplinary Team: A Retrospective Cohort Study

Sami El-Dalati, Bennett Collis, Takaaki Kobayashi, Evan Hall, Talal Alnabelsi, Chloe Cao, Meredith Johnson, John Gurley, Luke Strnad, Corey Adams, Victoria Weaver, Hassan Reda, Michael Sekela, Tessa London, Kara Kennedy, Armaghan-E Rehman Mansoor, David Olafsson, Grant Laugherty, Alyssa Tremblay, Angella Linder, Deborah Gill, Nicholas J Van Sickels, Alexander Pomakov, William Harris, Bobbi Jo Stoner

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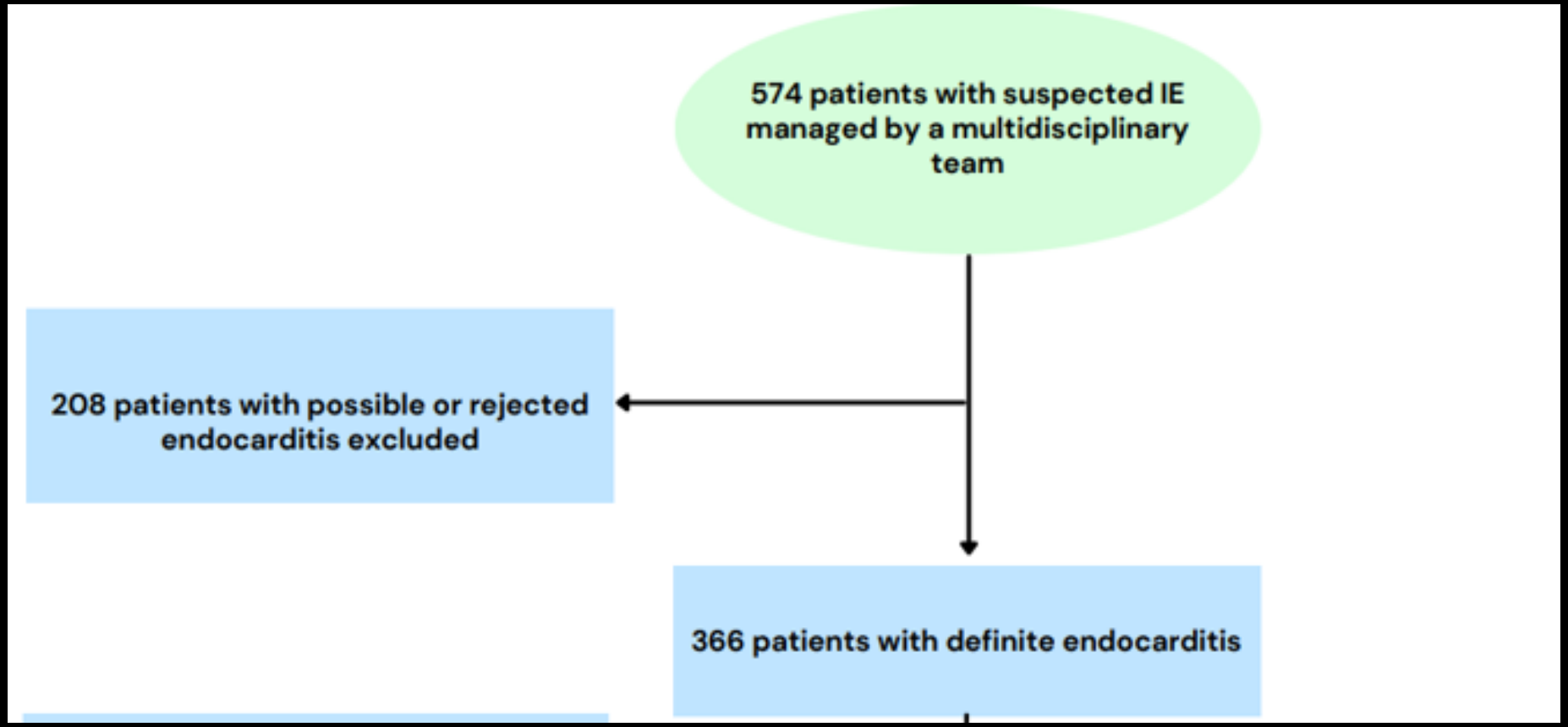
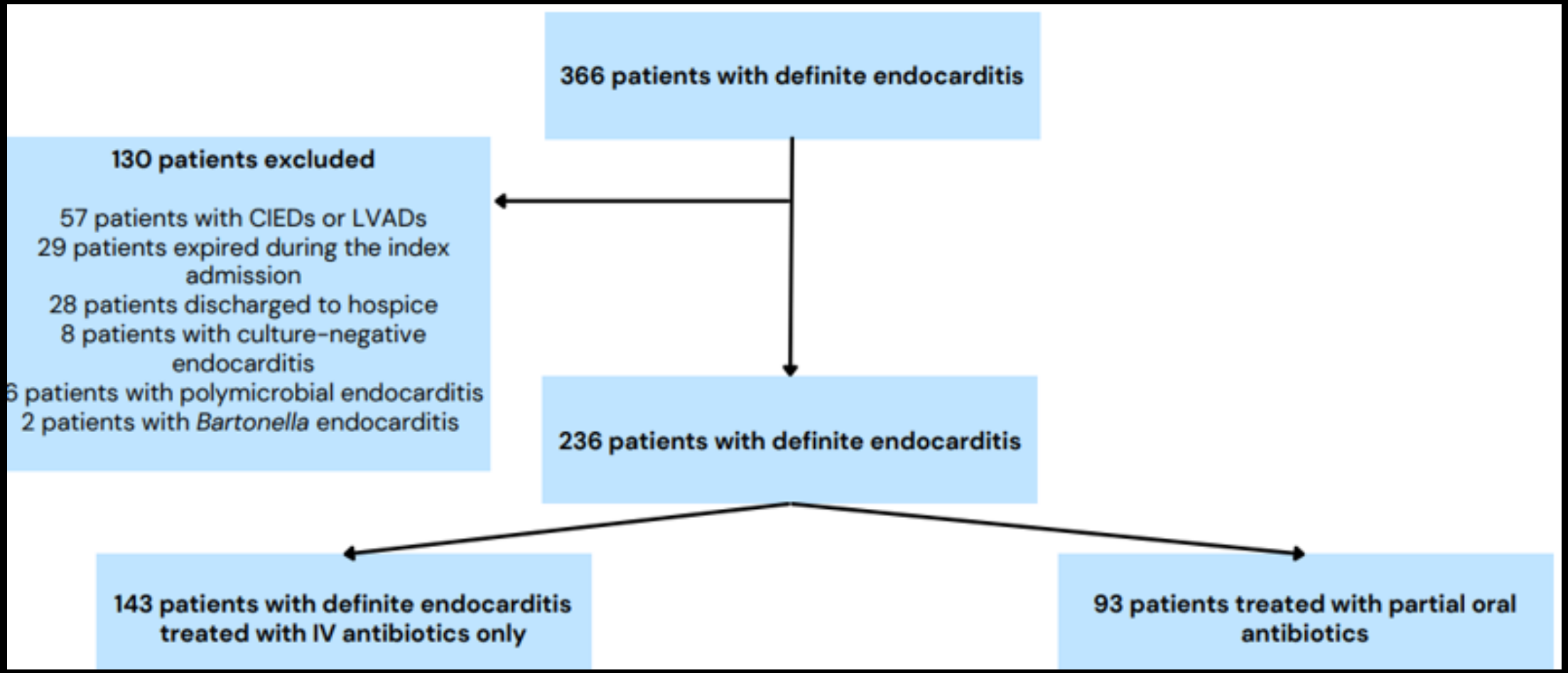
Oral Antibiotic Therapy for Endocarditis at UK



Oral Antibiotic Therapy for Endocarditis at UK



Demographics

Variable	Intravenous Only N = 143	Intravenous with Oral Course Completion N = 93	P Value
Age, % (n)	43 (33.5 - 54.5)	39 (33 - 50)	0.10
Male, % (n)	59.4 (85)	54.8 (51)	0.57
Female, % (n)	40.6 (58)	45.2 (42)	
Recent Injection Drug Use, % (n)	**58.0 (83)**	**57.0 (53)**	**0.88**
Hepatitis C Viremia, % (n)	35.7 (51)	28.0 (26)	0.22
Chronic Dialysis, % (n)	**6.3 (9)**	**0 (0)**	**0.01**
Previous Admission for IE, % (n)	**30.1 (43)**	**31.2 (29)**	**0.86**
Prosthetic Valve, % (n)	14.0 (20)	17.2 (16)	0.51
Outside Hospital Transfer, % (n)	45.5 (65)	53.8 (50)	0.21
Infectious Diseases Consult, % (n)	100 (143)	100 (93)	
Addiction Medicine Consult, % (n)	64.3 (92)	68.8 (64)	0.48
Cardiothoracic Surgery Consult, % (n)	82.5 (118)	83.9 (78)	0.78
Aortic Valve Vegetations, % (n)	32.2 (46)	31.2 (29)	0.87
Mitral Valve Vegetations, % (n)	37.1 (53)	30.1 (28)	0.28
Tricuspid Valve Vegetations, % (n)	**44.8 (64)**	**47.4 (44)**	**0.70**
Pulmonic Valve Vegetations, % (n)	2.1 (3)	0 (0)	0.16
Multivalvular Vegetation, % (n)	15.4 (22)	12.9 (12)	0.59
Pittsburgh Bacteremia Score, Median (IQR)	0 (0 - 2)	0 (0 - 2)	0.68
Acute Heart Failure Secondary to Infective Endocarditis, % (n)	36.4 (52)	44.1 (41)	0.24
Ischemic Stroke, % (n)	21.0 (30)	20.4 (19)	0.91
Intracranial Hemorrhage, % (n)	16.1 (23)	10.8 (10)	0.25
Epidural Abscess, % (n)	4.2 (6)	2.2 (2)	0.41
Vertebral Osteomyelitis, % (n)	11.9 (17)	12.9 (12)	0.82
Intensive Care Unit Admission, % (n)	55.2 (79)	64.5 (60)	0.16
Percutaneous Mechanical Aspiration, % (n)	3.5 (5)	5.4 (5)	0.48
Valve Surgery Performed, % (n)	**28.0 (40)**	**40.9 (38)**	**0.04**

Microbiology

Organism	Intravenous Only N = 143	Intravenous with Oral Course Completion N = 93	P-Value
Methicillin-Resistant Staphylococcus Aureus, % (n)	**33.6 (48)**	**25.8 (24)**	**0.20**
Methicillin-Susceptible Staphylococcus Aureus, % (n)	29.4 (42)	28.0 (26)	0.82
Coagulase Negative Staphylococcus, % (n)	3.5 (5)	3.2 (3)	0.90
Streptococcal Species, % (n)	15.4 (22)	18.3 (17)	0.56
Enterococcus Species, % (n)	8.4 (12)	21.5 (20)	0.001
Serratia Species, % (n)	5.6 (8)	1.1 (1)	0.08
Candida Species, % (n)	1.4 (2)	0 (0)	0.25
Pseudomonas Species, % (n)	1.4 (2)	1.1 (1)	0.84
Cardiobacterium hominis, % (n)	0 (0)	1.1 (1)	0.21
Aggregatibacter aphorphilus, % (n)	0.70 (1)	0 (0)	0.42
Rothia mucilaginosa, % (n)	0.70 (1)	0 (0)	0.42

Duration of Therapy

Variable	Intravenous Only N = 143	Intravenous with Oral Course Completion N = 93	P-Value
Days of Intravenous Therapy prior to Oral Course Completion, Median (IQR)	N/A	**18 (12 - 27)**	N/A
Days of Oral Course Completion, Median (IQR)	N/A	**14 (10 - 23)**	N/A
Total Days of Antimicrobial Therapy (Median (IQR)	41 (27 - 41)	41 (29 - 42)	0.04
Consolidation Oral Antimicrobial Therapy, % (n)	26.6 (38)	16.1 (15)	0.06
Days of Oral Consolidation Antimicrobial Therapy, Median (IQR)	92 (73.3 - 122.3)	81 (52.5 - 185)	0.11

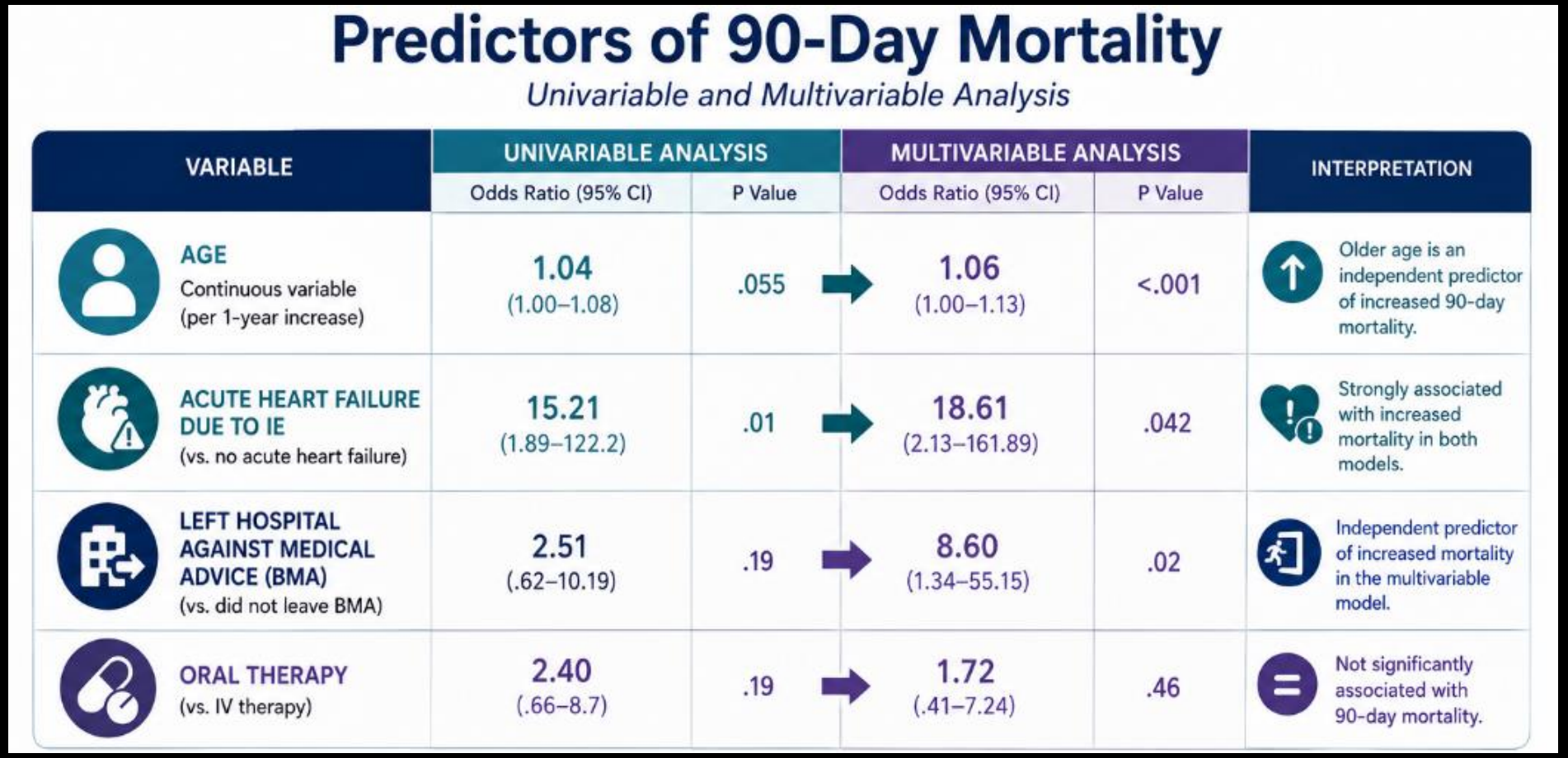
Clinical Outcomes

Variable	Intravenous Only T N = 143	Intravenous with Oral Course Completion N = 93	P-Value
Total Days of Hospital Admission, Median (IQR)	**28 (15 - 45)**	**22 (14 - 33)**	**0.001**
Discharge Before Medically Advised, % (n)	15.4 (22)	15.1 (14)	0.95
30-Day Readmission, % (n)	30.1 (43)	22.6 (21)	0.21
30-Day Relapsed Infection, % (n)	0.70 (1)	0 (0)	0.42
30-Day All-Cause Mortality, % (n)	0.70 (1)	1.1 (1)	0.75
90-Day Readmission, % (n)	36.4 (52)	32.3 (30)	0.52
90-Day Relapsed Infection, % (n)	**0.70 (1)**	**2.2 (2)**	**0.32**
90-Day All-Cause Mortality, % (n)	**2.8 (4)**	**6.5 (6)**	**0.17**
Composite of 90-Day All-Cause Mortality and Relapsed Infection, % (n)	**3.5 (5)**	**8.6 (8)**	**0.09**

MRSA Outcomes

Methicillin-Resistant Staphylococcus Aureus			
Variable	**Intravenous Only Therapy N = 48**	**Intravenous with Oral Course Completion Therapy N = 24**	**P Value**
Intravenous Antimicrobial Therapy, % (n)	100 (48)	100 (24)	
Daptomycin, % (n)	54.2 (26)	83.3 (20)	0.01
Vancomycin, % (n)	66.7 (32)	45.8 (11)	0.09
Linezolid, % (n)	2.1 (1)	0 (0)	0.48
Ceftaroline, % (n)	2.1 (1)	8.3 (2)	0.22
Dalbavancin, % (n)	2.1 (1)	8.3 (2)	0.22
Oral Course Completion Therapy, % (n)	N/A	24 (100)	
Days of Oral Course Completion Therapy, Median (IQR)	**N/A**	**14 (9.3 - 17.5)**	
Linezolid, % (n)	**N/A**	**24 (100)**	
Total Duration of Antibiotic Therapy, Median (IQR)	**41 (18.8 - 42)**	**41.5 (35.3 - 43)**	**0.98**
Oral Consolidation/Suppressive Therapy, % (n)	25.0 (12)	20.8 (5)	0.69
30-Day Relapsed Infection, % (n)	2.1 (1)	0 (0)	0.48
30-Day All Cause Readmission, % (n)	25.0 (12)	20.8 (5)	0.69
30-Day Mortality, % (n)	0 (0)	0 (00)	
90-Day Relapsed Infection, % (n)	**2.1 (1)**	**8.3 (2)**	**0.22**
90-Day All-Cause Readmission, % (n)	**31.3 (15)**	**33.3 (8)**	**0.86**
90-Day Mortality, % (n)	**0 (0)**	**0 (0)**	

Clinical Outcomes



Follow-Up

Variable	Intravenous Only N = 143	Intravenous with Oral Course Completion N = 93	P-Value
Discharge with Medication for Opioid Use Disorder, % (n)	44.1 (63)	54.8 (51)	0.11
University of Kentucky Infectious Diseases Outpatient Follow Up, % (n)	69.9 (100)	79.6 (74)	0.10

Clinical Outcomes

- 6 deaths at 90-days in the PO group
  - 3 patients died from complications of heart failure after they were deemed to not be candidates for valve surgery
  - 2 patients died of suspected opioid overdose
  - 1 patient died who discharged before medically advised

- 2 relapsed infections at 90-days in the oral group
  - Both occurred in patients with MRSA
    - One patient was prescribed an additional course of consolidative oral antibiotics for concurrent vertebral osteomyelitis and stopped this medication before recommended and was re-admitted with relapsed MRSA bacteremia
    - One patient completed a course of oral antibiotics but had ongoing injection drug use and was readmitted with MRSA bacteremia and tricuspid valve IE.

Research

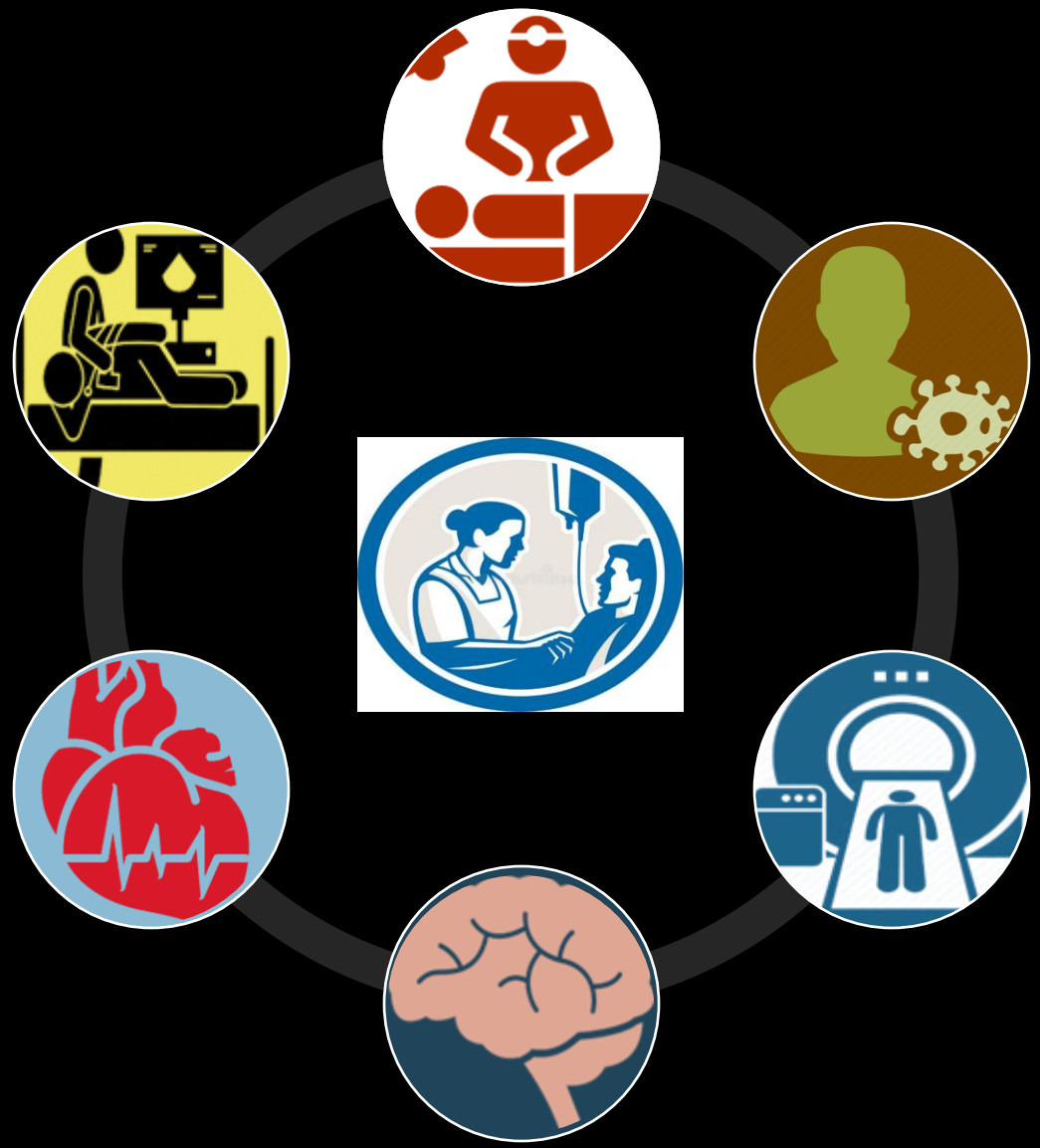
- MDET → REDCap Registry
  - Enter new patients as they are discussed
  - Ideal research opportunity for medical students, residents, fellows
  - Creates opportunities for multi-center collaboration

Research

- Since 2021
  - >35 peer-reviewed publications related to endocarditis
  - Topics including:
    - Oral antibiotics
    - Secondary Candida infection
    - Tricuspid valve endocarditis
    - Percutaneous mechanical aspiration
    - Combination antibiotic therapy for MSSA endocarditis
    - Neurologic complications of endocarditis
    - Co-treatment of hepatitis C

Take Home Points

- Transitions to oral therapy are a viable, evidence-based option for many patients with infective endocarditis
- Multidisciplinary endocarditis teams can help reduce short-term mortality and select patients for oral treatment
- Despite high-quality data, uptake of partial oral antibiotic therapy for endocarditis remains low



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Questions?

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