INFECTIVE ENDOCARDITIS

IN PEOPLE WHO INJECT DRUGS

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COMMUNITY HEALTH RESOURCES

NO FINANCIAL DISCLOSURES

CLINICAL CASE

Presenting Complaint: Right Hip Pain, AMS

- 59 year old male who was brought to the ED 2/17 by his significant other after using drugs and was unresponsive in their car
- Hypotensive and febrile
- Administered Narcan, IV fluids and started on pressors
- Reported using fentanyl to treat his right hip pain

PMH: Severe Right Hip Osteomyelitis, Microcytic Anemia, Anxiety, GERD, Osteomyelitis of Bilateral Feet s/p left transmetatarsal amputation and Several Right Toe Amputations, DVT, Alcohol Use Disorder, Pancreatitis, HTN, OUD, Vit B12 Deficiency

Substance use history: started using opioids 20 yrs ago, tried Percocet in the past but transitioned to fentanyl, tried Suboxone briefly 5 yrs ago but did not control his symptoms, never been on methadone, has had some short term oxycodone scripts. No benzos. Hx of AUD but quit 1 yr ago, occasionally vapes and sniffs cocaine

Social history: homeless due to increased rent, currently living out of his truck w/ girlfriend and cats

Admitting Diagnosis: AMS, Septic Shock, Bilateral CAP vs Aspiration PNA

CLINICAL CASE

Vitals: BP 71/37, HR 70, Temp 100.4, Resp 14, SpO2 96%

Labs: WBC: 9.5, H/H: 8/25, Na: 127 BUN/Cr: 34/1.5

Blood cultures: Negative

Utox: + Fentanyl, Cocaine

Head CT: Chronic occipital infarct

Chest CT: c/w multifocal PNA

Consults: Orthopedics, SW, Addiction Medicine, ID, Cardiology, CT Surgery
Hospital Course: started on abx for his PNA by ID. Ortho aspirated R hip, culture negative. All cultures thus far negative.

Addiction Medicine input: Addiction, Chronic pain, homelessness, financial hardship. Short-term pain treatment w/ full agonist. Dilaudid IV and PO, plan for Suboxone, nicotine replacement, Narcan at d/c.

TTE: EF 55%, RV sev reduced, MV leaflets thickened, moderate MR, severe TR, severe AI, thickened AV

TEE: EF 55%, moderate MR, no MV veg, severe AI, AV veg, no abscess

EPIDEMIOLOGY

- Patients admitted with IDU-IE tend to be younger with fewer comorbidities compared to non-IDU-IE
- Admissions for IDU-IE are increasing and increasing fastest among younger people
- Patients in 15-34 age group accounted for 37% of IDU- IE cases in 2010 and 46.7% in 2015
- Mortality in people with non-IDU-IE is a bit higher- likely related to prior health status
- Mortality of IDU-IE at 6 months is 14%
- One-year mortality for people who inject drugs (PWID) and had a second episode of endocarditis was 36.3%
- PWID are more likely to have a patient-directed discharge (AMA) and incomplete antibiotic treatment

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
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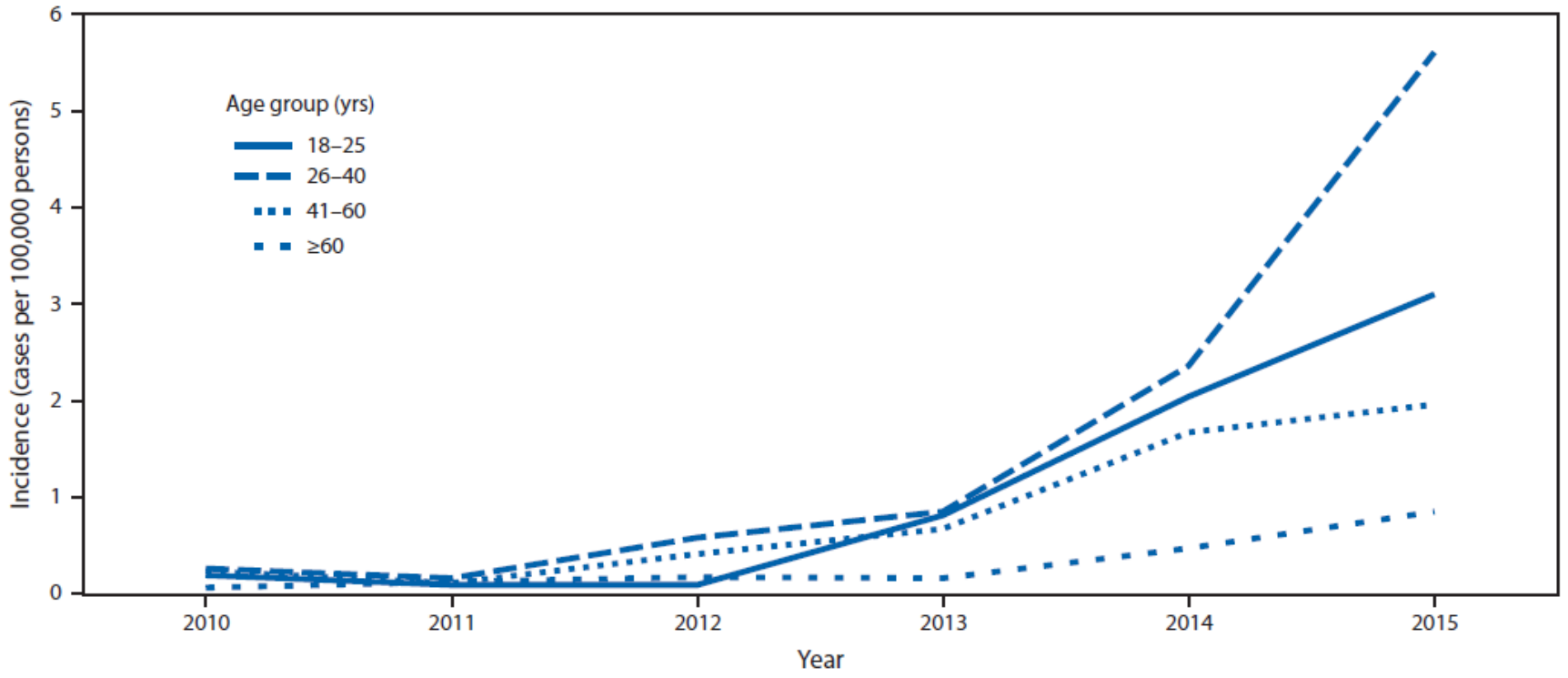
Hospitalizations for Endocarditis and Associated Health Care Costs Among Persons with Diagnosed Drug Dependence — North Carolina, 2010–2015

Aaron T. Fleischauer, PhD[1,2]; Laura Ruhl, MD[3]; Sarah Rhea, DVM[1,4]; Erin Barnes, MD[5]

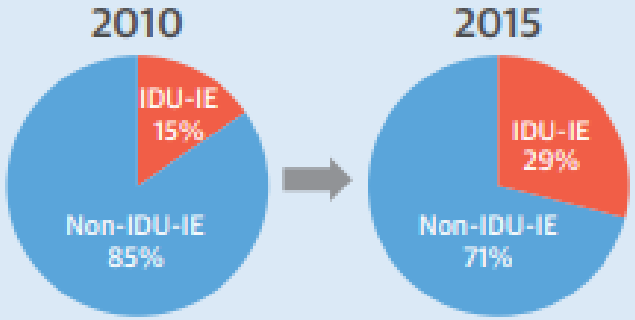
FIGURE 1. Incidence* of hospital discharge diagnoses of drug dependence–associated endocarditis,† by age group — North Carolina, 2010–2015



* North Carolina Hospital Discharge database, which includes discharge data from all 128 hospitals in North Carolina.
† Ninth and tenth revisions of *International Classification of Diseases Clinical Modification and Related Health Problems* (ICD-9-CM or ICD-10-CM) codes for both drug dependence and endocarditis.

CENTRAL ILLUSTRATION **Infective Endocarditis in Injection Drug Users**

Increased Incidence



Equivalent Readmission Rates

	Non-IDU-IE	IDU-IE
30-Day Readmission	22.9%	23.8%
180-Day Readmission	22.8%	22.3%

Decreased Index Mortality Relative to Non-IDU-IE

↓ OR: 0.60	Surgery
↓ OR: 0.75	No Surgery

Different Causes of Readmission Relative to Non-IDU-IE

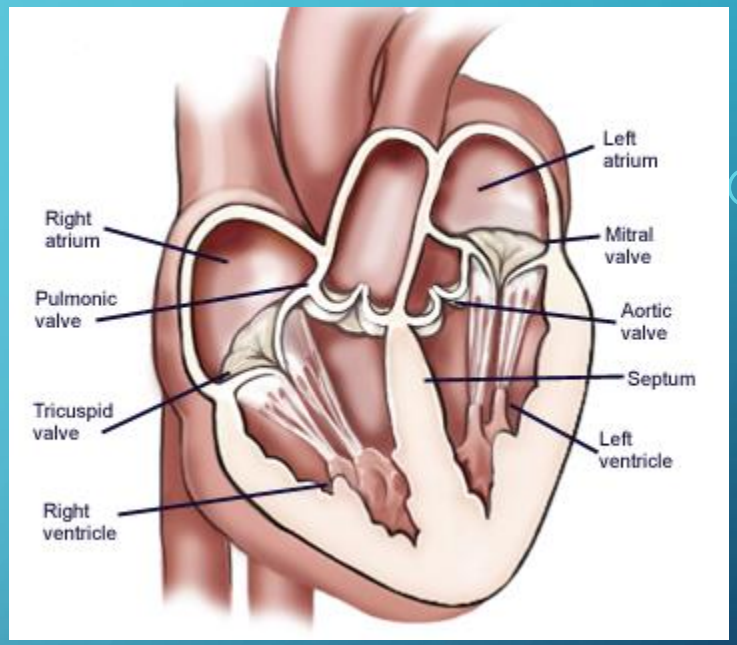
Septicemia ↑	HR = 1.83
Endocarditis ↑	HR = 2.42
Drug Abuse ↑	HR = 4.91

Rudasill, S.E. et al. J Am Coll Cardiol. 2019;73(5):559-70.

Infective endocarditis in injection drug users is increasing in incidence and is associated with decreased index mortality, equivalent rates of 30- and 180-day readmission, and increased risk of readmission for septicemia, endocarditis, and drug abuse.

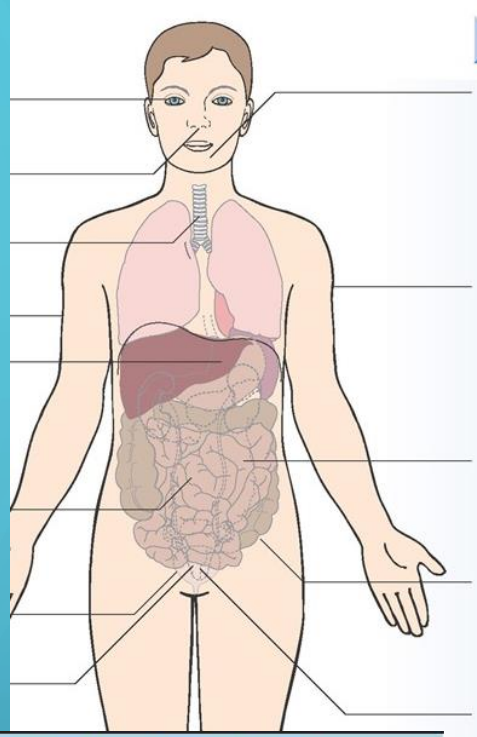
INFECTIVE ENDOCARDITIS

- Tricuspid valve (right-sided) endocarditis more common than left-sided in PWID: the TV is involved in 90% of cases
- IDU increases risk of IE by 100 times relative to the general population
- Predisposing factors: prior history of endocarditis, prosthetic valve, injection practices



PATHOGENS

- *Staphylococcus aureus* (MSSA or MRSA): most common (60-90% of cases)
- Streptococci (viridans group) (20%)
- Coagulase-negative staphylococci
- *Enterococcus (2%)*
- Gram-negative bacilli (e.g., *P. aeruginosa*) (10%)
- *Candida* species (usually C. *albicans*) (5%)
- Persons who inject drugs have 16.3x more invasive MRSA infections than others

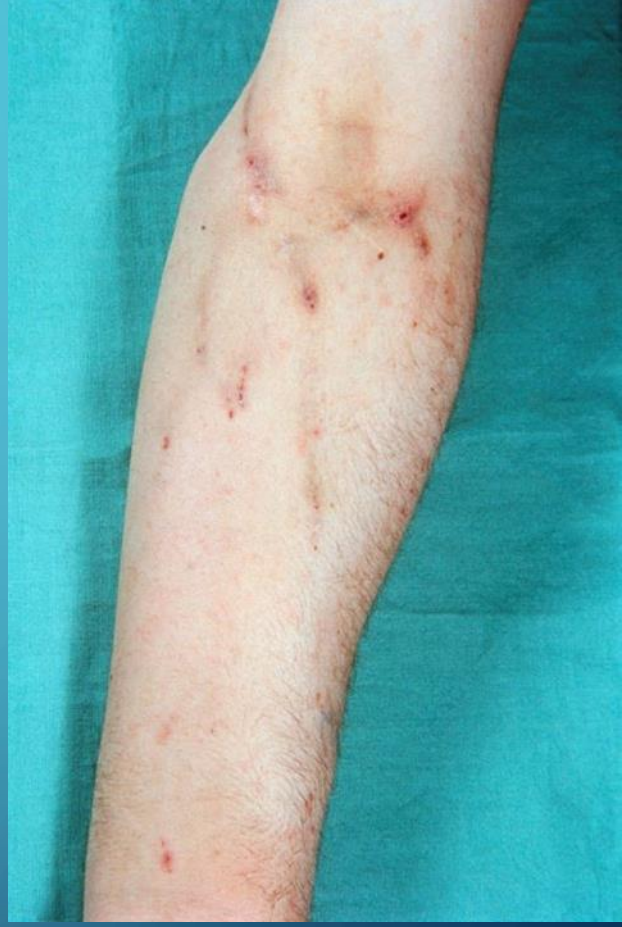


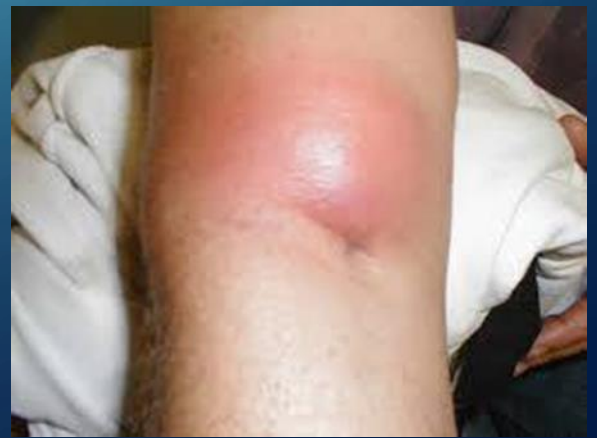
Members of the Normal Flora[1]	Anatomic Location
Bacteroides species	Colon, throat, vagina
Candida albicans	Mouth, colon, vagina
Clostridium species	Colon
Corynebacterium species (diphtheroids)	Nasopharynx, skin, vagina
Enterococcus faecalis	Colon
Escherichia coli and other coliforms	Colon, vagina, outer urethra
Gardnerella vaginalis	Vagina
Haemophilus species	Nasopharynx, conjunctiva
Lactobacillus species	Mouth, colon, vagina
Neisseria species	Mouth, nasopharynx
Propionibacterium acnes	Skin
Pseudomonas aeruginosa	Colon, skin
Staphylococcus aureus	Nose, skin
Staphylococcus epidermidis	Skin, nose, mouth, vagina, urethra
Viridans streptococci	Mouth, nasopharynx

[1]In alphabetical order.

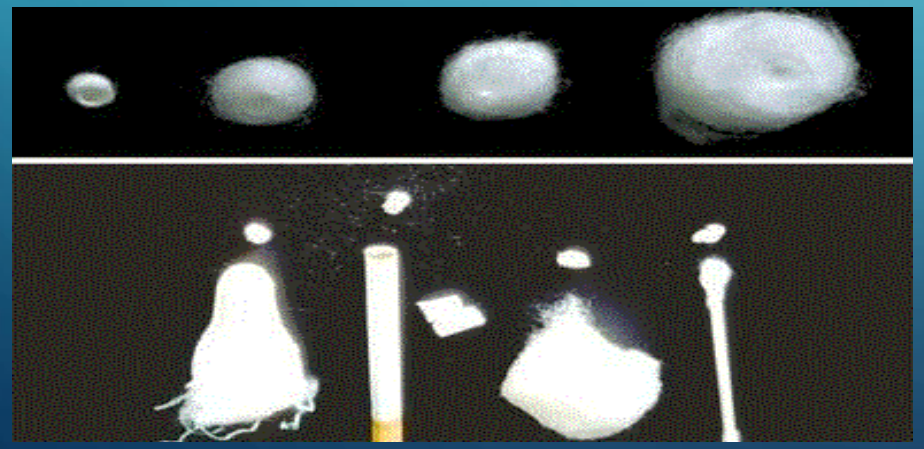
SOURCES OF INFECTION RELATED TO IDU

- Normal bacterial flora on hands, skin: *Staphylococcus*, *Streptococcus*- most common organisms in skin infections, bacteremia, endocarditis
- Organisms contaminating the drug or adulterants
- Organisms contaminating the materials/paraphernalia: filters, water source, cookers, prep surface, etc
- Oral flora: licking needles or holding syringes in mouth
- Tap water: *Pseudomonas*



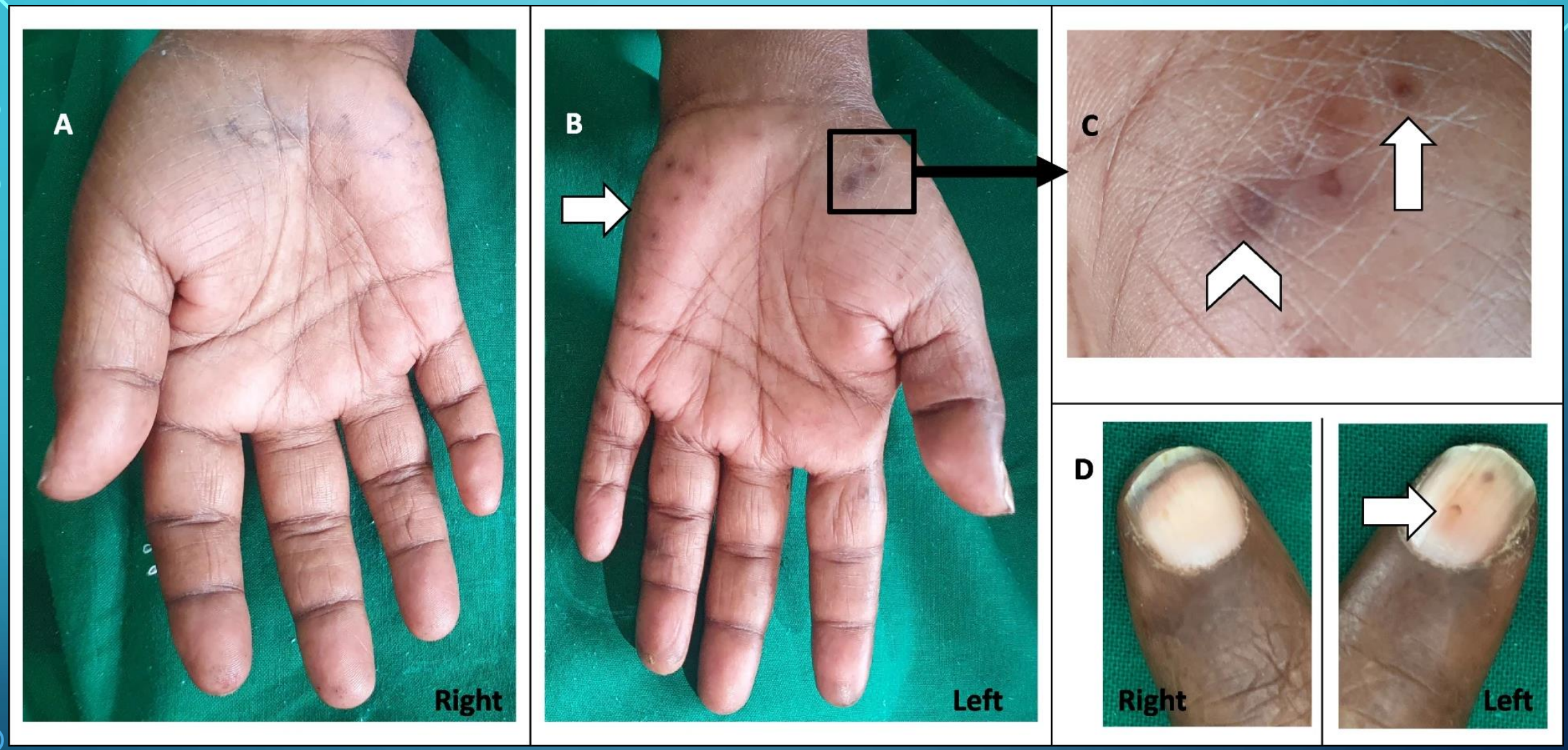


DRUG INJECTION SUPPLIES



CLINICAL PRESENTATION

- Symptoms: fever, chills, malaise, dyspnea, cough, chest/back pain, arthralgia/myalgia, neurologic symptoms, decreased appetite, weight loss, fatigue, night sweats
- Overlap with opioid withdrawal symptoms
- Duration: acute (days to weeks) most often) vs sub-acute (weeks to months)
- Exam: heart murmur; subacute immunologic findings (uncommon): Osler's nodes, Janeway lesions, Roth spots; look for skin lesions (abscess)
- Complications: septic pulmonary emboli (right-sided); stroke, brain abscess, mycotic aneurysm, splenic/renal/liver abscesses (left-sided)
- Often misdiagnosed as pneumonia and patients return with partially treated IE
- Bone and joint infections may simultaneously be present: ie epidural abscess, septic arthritis
- Have a high index of clinical suspicion for IE in PWID



Right hand (A) is normal while the left hand (B) has Osler's nodes and Janeway lesions over the thenar and hypothenar eminences (arrow). The lesions over the thenar eminence are magnified in C which shows Osler's nodes (arrow) and Janeway lesions (arrowhead). Splinter haemorrhages of the left nailbed (arrow) and the normal nails of the right hand are shown in D

DIAGNOSIS:

2023 Duke Clinical Criteria for Definitive IE: 2 Major OR 1 Major + 3 Minor OR 5 Minor.

- **Major (microbiology):**
  - *Typical organisms x 2 blood cultures*
  - *Non-typical organisms x 3/3 or 3/4 positive blood cultures*
- **Major (imaging):**
  - *Echocardiography* or cardiac CT w/ vegetation, valvular/leaflet perf/abscess, aneurysm, intracardiac fistula
  - New valve regurgitation
  - New partial dehiscence of prosthetic valve as compared with previous imaging
  - Abnormal metabolic activity involving a native or prosthetic valve, ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads or other prosthetic material on [18F]FDG PET/CT imaging
- **Major (surgical):**
  - Evidence of IE documented by direct inspection during heart surgery, neither Major Imaging Criteria nor subsequent histologic or microbiologic confirmation
- **Minor:**
  - Predisposing cardiac condition (h/o IE, h/o valve repair, prosthetic valve, congenital heart disease, > mild regurgitation or stenosis, CIED, hypertrophic obstructive CM) or IDU
  - Fever ≥ 38°C (100.4°F)
  - Vascular phenomenon (arterial emboli, mycotic aneurysm, intracerebral bleed, conjunctival hemorrhages, Janeway lesions)
  - Immune phenomenon (glomerulonephritis, Osler nodes, Roth spots, positive rheumatoid factor)
  - Positive blood cultures not meeting the above criteria or positive PCR or other nucleic acid-based test (amplicon or shotgun sequencing, in situ hybridization) for an organism consistent with IEr from a sterile body site other than cardiac tissue, cardiac prosthesis, or arterial embolus; or a single finding of a skin bacterium by PCR on a valve or wire without additional clinical or microbiological supporting evidence.
  - Abnormal metabolic activity as detected by [18F]FDG PET/CT within 3 mo of implantation of prosthetic valve, ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads or other prosthetic material
  - New valvular regurgitation identified on auscultation if echocardiography is not available

TREATMENT OF INFECTIVE ENDOCARDITIS

Antibiotics

- Get blood cultures first!!!
- Consider selection, duration, route of administration
- Initial/empiric: vancomycin (in the U.S.) +/- oxacillin or nafcillin
- Sometimes broad-spectrum indicated based on clinical acuity, history
- Narrow based on culture results
- Oxacillin or nafcillin preferred for MSSA
- Vancomycin for MRSA or severe PCN allergy; alternative: daptomycin
- Typically 6 weeks IV
- See guidelines for other pathogens and native vs prosthetic valve regimens

TREATMENT OF INFECTIVE ENDOCARDITIS

Antibiotics

- Short-course therapy (2 weeks) with IV abx may be possible for some patients with uncomplicated TV endocarditis (if vegetation < 2cm, no emboli besides lung, negative blood cultures by day 4)
- IDU is not an absolute contraindication to use of a PICC
- Once weekly outpatient antibiotic infusions (dalbavancin) may be appropriate in some cases
- Oral therapy can be considered in some instances as step-down therapy
    - Oral options based on susceptibility testing and after discussion with ID. Antibiotics used in published studies included linezolid, amoxicillin, and trimethoprim-sulfamethoxazole, among others.
        - The largest oral step-down trial (POET) did not have MRSA cases in their population, so this population is not as well studied

TREATMENT OF INFECTIVE ENDOCARDITIS

Surgery

- Indications: severe heart failure, uncontrolled infection, persistent bacteremia (> 5 days) despite abx, fungal endocarditis, unstable prosthetic valve, periannular extension, aortic abscess, heart block, large persistent vegetation and/or recurrent emboli.
    - Tricuspid valve: may consider valvectomy or vegetectomy + valvuloplasty.
    - Aortic or mitral valve: usually requires replacement.
- The reported proportion of patients with right-sided IE requiring surgery is 5%-40%.
- Available literature does not suggest a mortality difference between IDU and non-IDU patients with endocarditis

Use of valve surgery for DUA-IE invokes controversy, some reluctance among cardiac surgeons:

- Concern for post-operative injection drug use and associated risk of prosthetic valve infection; reinfection common if not on treatment for SUD
- Young adults who remain free of reinfection will probably require additional valve replacements
- Some surgeons requiring assurance there will be drug rehabilitation or refuse second or third valve replacement

ENDOCARDITIS SURGICAL INDICATIONS*

Size

R sided > 2cm or L sided >1cm

Enlarging veg despite abx

Structure

New onset heart failure

New heart block

Abscess

Stickyness

Fungi

MDR GNR or VRE

Blood cx positive >7d on abx

THE CURB SIDERS ADDICTION MEDICINE

*INDICATIONS IDENTICAL FOR IDU-IE AND NON-IDU-IE

CLINICAL CASE

TTE: EF 55%, RV sev reduced, MV leaflets thickened, moderate MR, severe TR, severe AI, thickened AV

TEE: EF 55%, moderate MR, no MV veg, severe AI, AV veg, no abscess

Hospital Course:

CT Surgery consulted: needs AVR but needs hip addressed first

Cardiology consult: is volume overloaded, needs diuresis. Rhythm stable. Needs neuro consult for w/u.
Ortho: R hip washout done, findings: large deep abscess.

He has a SIRS response in the PACU. Hypotensive needing large volume resuscitation and pressors. Tx to ICU. New RBBB on EKG.

CTA Head/Neck: no mycotic aneurysms

Brain MRI: changes in L occipital area, unable to rule out mycotic aneurysm need DSA.

Dental: Extractions as outpt

CLINICAL CASE

Hospital Course: starts to have rapid atrial fibrillation. Worsening renal function, worsening heart failure, new RBBB, rising LA. Renal consulted. Start CVVH.

DSA: Negative

Left heart catheterization: unable to be completed

Surgical Indications: worsening heart failure, unable to be controlled by medications, worsening end organ function, severe AI, new EKG changes concerning for abscess formation.

OR 2/26: AVR, TV repair

CLINICAL CASE

Post Op Course: Able to stop CVVH, no HD. Diuresed. Progressed down the surgical path. Maintained on Suboxone, thus far unable to wean off Oxy. Unable to d/c to home w/ PICC line. Started on A/C for AF. Significant debility and immobility from R Hip.

Barriers to D/C: Corporate denial from STR. Unable to d/c to home w/ PICC. must remain hospitalized for duration of 6 wks of abx (from OR date). Needs Suboxone provider. Significant debility

CLINICAL PEARLS

- Suspect endocarditis in any PWID with fever without an otherwise identifiable source
- Treat underlying SUD and proactively address withdrawal symptoms and social concerns when possible
- Multidisciplinary approach
- Consider alternative treatments to inpatient when patient is unwilling/unable to stay and discuss contingency planning around patient-directed discharge

PREVENTION: MOUD AND HARM REDUCTION

Recommended messages to reduce risk of infection for people who inject drugs:

- Use a sterile needle and syringe with every injection. Do not reuse or share syringes or drug-preparation equipment.
- Access syringe services programs for clean syringes, equipment, and naloxone.
- Clean hands with soap and water, clean the injection site with a new alcohol swab, and clean the area of preparation.
- Use sterile water to prepare drugs; otherwise use water boiled for 10 minutes, bottled water, or water from a clean tap.
- Use clean cookers and new cotton filters to prepare drugs.
- Never lick the needle or skin prior to injection.
- Avoid using the neck, legs, feet and groin.


GHHRC
ROVER


GHHRC
ROVER
SAFER

BARRIERS TO CARE: SOCIAL DETERMINANTS

Observations by Katie Vees, RN, Endocarditis Navigator, Hartford Hospital:

- Rate of homelessness has continued to increase over the last 3 years in CT, going up 13% from 2023 to 2024; housing vacancy rate is among the lowest in the nation.
- Lack of housing and lack of a solid transition plan impacts acceptance to SNFs
- Patients in SNFs have extremely long wait times in SNFs for any type of housing placement (months to years)
- SNF environment often found to be undesirable and patients will leave prior to housing placement
- "Patients become preoccupied and prioritize housing above healthcare and follow up. It's difficult to coach someone to engage in follow up when their priority is a roof over their head. It can be difficult to even access MTM (formerly Veyo) who require a physical address to pick someone up."
- "It can contribute to a lack of trust or confidence in healthcare workers or the system if their perception is 'we don't help them'. Unfortunately, the reality is that there is little social workers can do in the acute care setting (can get the process started, assist them to call 211). "
- "Patients often feel 'safer' in their tent or on the street as opposed to shelters or SNFs. An example of this is when one patient asked for help securing a tent and sleeping bag, but refused referrals to medical respite. "
- No streamlined program for phone distribution and many are still discharged with no phone.
- "In the endocarditis population, follow up compliance is especially important in determining impact of antibiotic treatment, presence or absence of valvopathy, timing of future potential surgery etc. Follow up remains very challenging when patients don't have phones, don't want to remain in undesirable SNF environments and don't envision getting any help or any benefit to staying in SNF."
- "Social workers in SNFs have large caseloads and patients may feel they are not getting helped because they lack face time (regardless if they are actually being helped 'behind the scene' or not). They often do not meet the social worker until being at the facility for a week. "
- "The general feeling expressed by patients is one of hopelessness."
- **Positive impact by the addition of the Addiction Consult team: "Patients express preferring to come here, knowing they will be helped at Hartford."**

"When I'm in it, I'm in it": Homelessness in the Endocarditis Population

Hartford HealthCare

Authors Credits: Kathleen Vees, MSN, RN; Monica Rae Cluff, DNP, APRN; Carolyn Burke-Martindale, MSN, APRN (Carolyn.martindale@hhchealth.org)

PURPOSE

- To examine the experience of homelessness in patients with drug-use associated infective endocarditis (DUA-IE) post hospitalization.

BACKGROUND

- Homelessness is common among the DUA-IE population.
- Hospitalization is an opportunity to connect patients to addiction treatment and other resources.
- Transitional planning is often difficult and complex with this population.
- With addiction-related brain changes, DUA-IE patients frequently lack awareness and insight required to navigate community services.
- Challenges include being homeless, no income, no transportation, frequent family estrangement, and lack of support.

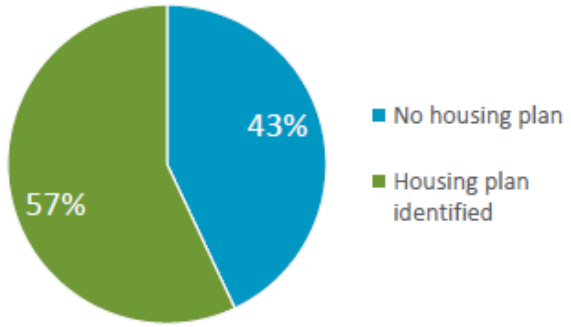
DUA-IE patient: "I've tried 211 before. They directed me to a shelter an hour away and I don't have a car. How was I supposed to get there?"

METHODS

- Constant comparative method[1] used to consider the experience of homelessness and the impact on health.
- Forty-four (44) patients with a diagnosis of prior or active DUA-IE between January 2022 and May 2022 were reviewed.

"When I'm in it, I'm in it. If you're on the street, you do drugs because that's how you cope with your life. When I don't have a place to go, I can't escape the drugs"

Post Hospitalization Homelessness among the Drug-Use Associated Endocarditis Population



"Being a female, I didn't wan to just sleep anywhere. Even when I had a place to stay, I wasn't safe there and everyone was using."

RESULTS

- 43% (19/44) of DUA-IE patients were identified as homeless or housing insecure.
- Complex feelings of desperation and frustration were common.
- Patients associated sobriety with having a place to live.
- Homeless women, often with histories of trauma and abuse, faced unique challenges. Some women have a place to stay; however, they do not feel safe.
- City shelters often lack social services and as one patient reported "in those places, it's too easy to get drugs."
- Themes of hopelessness, helplessness, frustration, fear and despair were prevalent with this high-risk population.

CONCLUSION

- Over 40% of DUA-IE patients are homeless post hospitalization without a safe housing plan.
- Coordination of care should include transitional care planning, inclusive of a safe housing plan.
- Efforts to break the cycle of drug-use and homelessness are vital for survival and recovery of DUA-IE patients.

REFERENCES

1. Strauss, A. & Corbin, J. (2008). *Basics of qualitative research*: Grounded theory procedures and techniques. Sage.

AHA SCIENTIFIC STATEMENT

Management of Infective Endocarditis in People Who Inject Drugs: A Scientific Statement From the American Heart Association

Larry M. Baddour, MD, FAHA; Melissa B. Weimer, DO, MCR; Alysse G. Wurcel, MD, MS; Doff B. McElhinney, MD, Vice Chair; Laura R. Marks, MD, PhD; Laura C. Fanucchi, MD, MPH; Zerelda Esquer Garrigos, MD; Gosta B. Pettersson, MD; Daniel C. DeSimone, MD, Chair; on behalf of the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee of the Council on Lifelong Congenital Heart Disease and Heart Health in the Young; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; and Council on Peripheral Vascular Disease

BACKGROUND: The American Heart Association has sponsored both guidelines and scientific statements that address the diagnosis, management, and prevention of infective endocarditis. As a result of the unprecedented and increasing incidence of infective endocarditis cases among people who inject drugs, the American Heart Association sponsored this original scientific statement. It provides a more in-depth focus on the management of infective endocarditis among this unique population than what has been provided in prior American Heart Association infective endocarditis–related documents.

METHODS: A writing group was named and consisted of recognized experts in the fields of infectious diseases, cardiology, addiction medicine, and cardiovascular surgery in October 2021. A literature search was conducted in Embase on November 19, 2021, and multiple terms were used, with 1345 English-language articles identified after removal of duplicates.

CONCLUSIONS: Management of infective endocarditis in people who inject drugs is complex and requires a unique approach in all aspects of care. Clinicians must appreciate that it requires involvement of a variety of specialists and that consultation by addiction-trained clinicians is as important as that of more traditional members of the endocarditis team to improve infective endocarditis outcomes. Preventive measures are critical in people who inject drugs and are cured of an initial bout of infective endocarditis because they remain at extremely high risk for subsequent bouts of infective endocarditis, regardless of whether injection drug use is continued.

Baddour LM et al. Management of Infective Endocarditis in People Who Inject Drugs: A Scientific Statement From the American Heart Association. Circulation. 2022 Oct 4;146(14):e187-e201.