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Practical Solutions for Antiretroviral Stewardship

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Disclosures

- The presenter has no real or perceived conflicts of interest related to this presentation

Note: This program may contain the mention of suppliers, brands, products, services or drugs presented in a case study or comparative format using evidence-based research. Such examples are intended for educational and informational purposes and should not be perceived as an endorsement of any particular supplier, brand, product, service or drug.

Learning Objectives

At the end of this session, participants should be able to:

1. Define the importance of antiretroviral stewardship
2. Describe the basics around managing a hospital's antiretroviral formulary
3. Identify resources available to find information on how to manage a drug interaction with antiretroviral therapy

Audience Poll Question: #1 of 2

I am a _____

a. Nurse
b. Pharmacist
c. Physician
d. Other

Audience Poll Question: #2 of 2

I would describe my knowledge of antiretroviral therapy and antiretroviral stewardship as _____

a. Minimal
b. Average
c. Above average
d. Expert

What is Antiretroviral Stewardship?

Differentiating Between Antimicrobial & Antiretroviral Stewardship

Antimicrobial Stewardship Programs (ASP)

- Definition:
  - "Coordinated interventions designed to improve and measure the appropriate use of agents by promoting the selection of the optimal drug regimen, including dosing, duration of therapy, and route of administration"
- Goals:
  - Right Drug
  - Right Dose
  - Right Route
  - Right Duration

Antiretroviral Stewardship Programs (ARVSP)

- Definition:
  - "Coordinated interventions designed to improve continuity of care for patients receiving ARVs through the utilization of evidence-based ARV practices including medication reconciliation, dosing, mitigation of drug interactions, and prevention of viral resistance"
- Goals:
  - Right Drug
  - Right Dose
  - Right Route

Koren D et al. *Clin Infect Dis.* 2020, 2241–2246
SHEA. *Infect Control Hosp Epidemiol* 2012; 33:322 –7

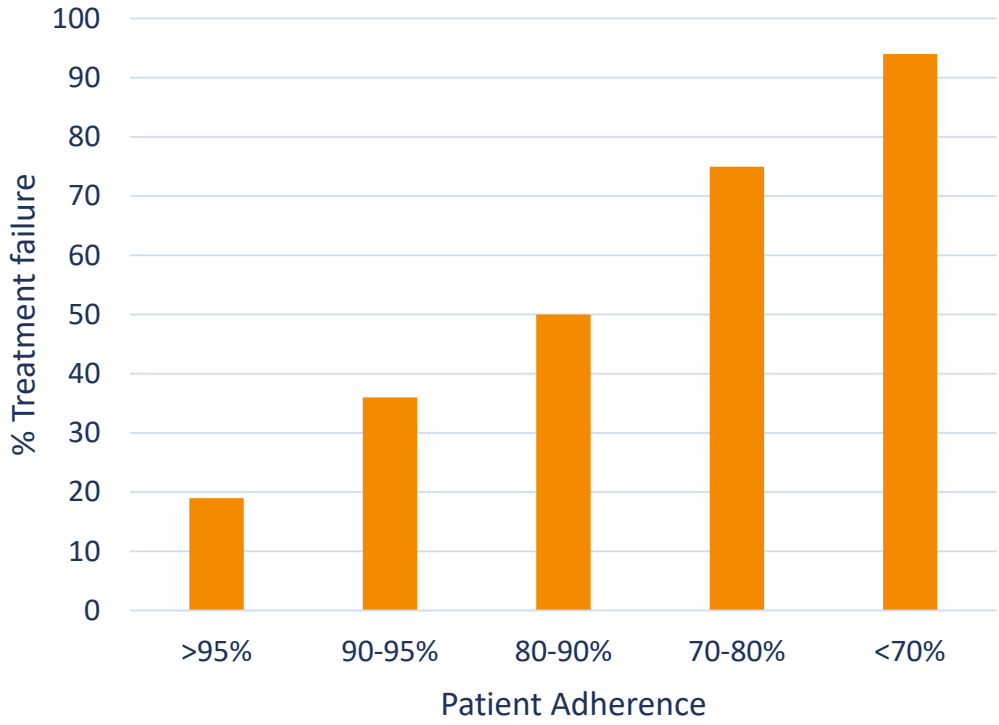
Why is Continuing the Continuity of Care so Important with Antiretroviral Therapy?

- Adherence is integral to the long-term success with antiretroviral therapy

- Increased adherence to therapy is associated with:
  - Less virologic failure
  - Higher CD4 lymphocytes
    - ✓ Lower risk opportunistic infection

- Goal adherence associated with improved outcomes
  - Historically: ≥ 90–95%

- Recent data suggests
  - May be regimen dependent
  - Some regimens maybe fine with 75–80% adherence



Paterson D, et al. *Ann Intern Med*. 2000;133:21–30.
Bangsberg D, et al. *AIDS*. 2000;14:357–366.
Arnsten J, et al. *J Gen Intern Med*. 2002;17:377–381.
Cheng, Y., et al. *Medicine*, 2018 *97*(2), e9430.
Pharmacy Quality Alliance. https://www.pqaalliance.org/assets/Measures/PQA_HIV_Measure_Overview.pdf Accessed May 20th, 2021

Barriers to Adherence

Outpatient Setting

- Social situations
- Clinical condition
- Prescribed regimen
- Patient-provider relationship

Regimen components associated with improved adherence

- Once daily regimens
- Low pill burden
- Without food requirements
- Few side effects or toxicities

Inpatient Setting

- Medication reconciliation issues
- Hospital formulary
  - Not having the appropriate combination product
  - Not having the appropriate formulation
- Order entry errors
  - Timing
- Acute conditions
  - Acute renal failure
  - Loss of oral route

Panel on Antiretroviral Guidelines for Adults and Adolescents. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/AdultandAdolescentGL.pdf. Accessed (6/15/2021).

Raboud J, et al. AIDS Behav. Oct 2011;15(7):1397-1409.
Clay PG, et al. *Medicine.* Oct 2015;94(42):e1677.
Liedtke MD, et al. HIV Med 2016; 17:717–23.
Nachega JB, et al. *Clin Infect Dis.* May 2014;58(9):1297-1307.
Li EH, Foisy MM. Ann Pharmacother 2014; 48:998–1010.
Yehia BR, et al. Clin Infect Dis 2012; 55:593–9

How Are We Doing?

- In the United States of America
  - Medication error rates with antiretroviral therapy on admission have been reported to as high as **85%**
  - **1/3 or all medication errors** with antiretroviral therapy go uncorrected at patient discharge

- Factors leading to antiretroviral therapy medications include
  - Failure to complete or incomplete medication reconciliation
  - Institutional formulary restrictions
  - Concomitant medication change
  - Swallowing difficulties
  - Alterations to hepatic and renal function

Koren D et al. *Clin Infect Dis.* 2020, 2241–2246
Li EH, Foisy MM. Ann Pharmacother 2014; 48:998–1010
Yehia BR, et al. Clin Infect Dis 2012; 55:593–9
Chiampas et al. Pharm Pract (Granada) 2015; 13:512
Liedtke MD, et al. HIV Med 2016; 17:717–23

Clinical Infectious Diseases

IDSA FEATURES

A Call to Action: The Role of Antiretroviral Stewardship in Inpatient Practice, a Joint Policy Paper of the Infectious Diseases Society of America, HIV Medicine Association, and American Academy of HIV Medicine

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Koren D et al. *Clin Infect Dis.* 2020, 2241–2246

Ways to Move the Needle

Three main approaches described in literature

1. Systematic processes to ensure safe prescribing practices
   - Checklist order entry
     - — Medication reconciliation
     - — Verification of dosing
     - — Monitoring drug interaction

2. Leverage technical support
   - Computerized provider order entry (CPOE) orderset
   - Monitoring tool rules

3. Prospective audit and feedback

Koren D et al. *Clin Infect Dis.* 2020, 2241–2246

Clinical Checklist at Order Entry

- Have been shown to
  - Reduce medication errors
  - Streamline order process
  - Avoid drug interactions

Study	Intervention	Results
Shea, et al. (2018) Pre and post	• Clinical check list (focused on regimen, dose, administration, and drug-interaction) • CPOE ordersets • Prospective audit and feedback • Education	Lower rates of medication error • 68% vs 12%, pre and post respectively (P<0.001)
Heelon, et al. (2007) Pre and Post	• Clinical check list (focused on regimen, dose, administration, and drug-interaction) • Prospective audit and feedback	No difference frequency of errors Faster time to resolution of these errors • 84 vs. 15 hours, pre & post respectively (P<0.001)

Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85
Heelon M, et al. Am J Health Syst Pharm 2007; 64:2064–8

Computerized Provider Order Entry (CPOE) Ordersets

- Leverage the electronic health record to standardized practices and improve patient safety

- Has been shown to particularly help for:
  - Antiretroviral specific instructions
  - Standardizing best practices
  - Drug-interactions
  - Drug-food interactions
  - Dosing recommendations

- CPOE orderset have been found to reduce medication errors > 40%

Liedtke MD, et al. HIV Med 2016; 17:717–23.
DePuy AM, et al. Open Forum Infect Dis 2019; 6:ofz290
Sanders J, et al. Infect Control Hosp Epidemiol 2014; 35:272–7.
Zucker J, et al. Pharmacotherapy 2016; 36:245–51.
Carcelero E, et al. HIV Med 2011; 12:494–9.
Eginger KH, et al. Ann Pharmacother 2013; 47:953–60.
Lauzevis S, et al. Med Mal Infect 2013; 43:391–7.
Bias TE, et al. J Pharm Tech 2014; 30:48–53.
Billedo JA, et al. J Int Assoc Provid AIDS Care 2016; 15:84–8.
Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85.
Batra R, et al. Antivir Ther 2015; 20:555–9.
Daniels LM, et al. Am J Health Syst Pharm 2012; 69:422–30.
Heelon M, et al. Am J Health Syst Pharm 2007; 64:2064–8.

Prospective Audit & Feedback

- Most common describe process and literature
- Prospective audit and feedback commonly used as part of antimicrobial stewardship
- Can be used to address initial medication errors as well as prevent additional medication errors which occur during hospitalization
- Numerous studies have shown this has been as safe and effective way at improving and preventing medication errors with antiretroviral therapy
  - ~ 95% of medication errors

Liedtke MD, et al. HIV Med 2016; 17:717–23.
DePuy AM, et al. Open Forum Infect Dis 2019; 6:ofz290
Sanders J, et al. Infect Control Hosp Epidemiol 2014; 35:272–7.
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Assessment Question #1 of 3

The goal of an antiretroviral stewardship program is to give the patient _____.

a. Right Drug
b. Right Dose
c. Right Route
d. All of the above

Assessment Question #1: Correct Response

The goal of an antiretroviral stewardship program is to give the patient _____.

a. Right Drug
b. Right Dose
c. Right Route
d. All of the above

Medication Errors with Antiretroviral Therapy

Classification of Medication Errors with Antiretroviral Therapy

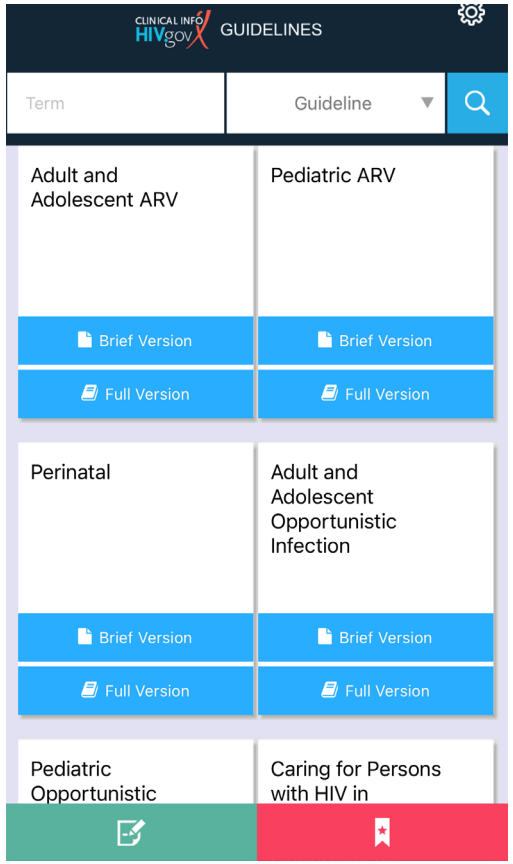
Error	Example
Wrong drug/formulation	Confusing sound-alike or look-alike medication names • Example: lamivudine & lamotrigine
	Abbreviations leading to dispensing wrong medication • Example: prescriber wrote for AZT intending for aztreonam, patient received zidovudine (AZT)
Wrong dose	Overdosing/ underdosing
	Failure to adjust for renal/hepatic impairment
	Failure to adjust for patient weight
Wrong dosing frequency	Too often/too infrequent
Drug interactions	Drug-drug interactions
	Drug-food interactions
	Drug-herbal interactions
Missing Information	Dose strength missing
	Dose frequency missing
	Dietary restrictions missing

Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85.

General Resources

- APPS
  - https://clinicalinfo.hiv.gov/en/mobile-applications

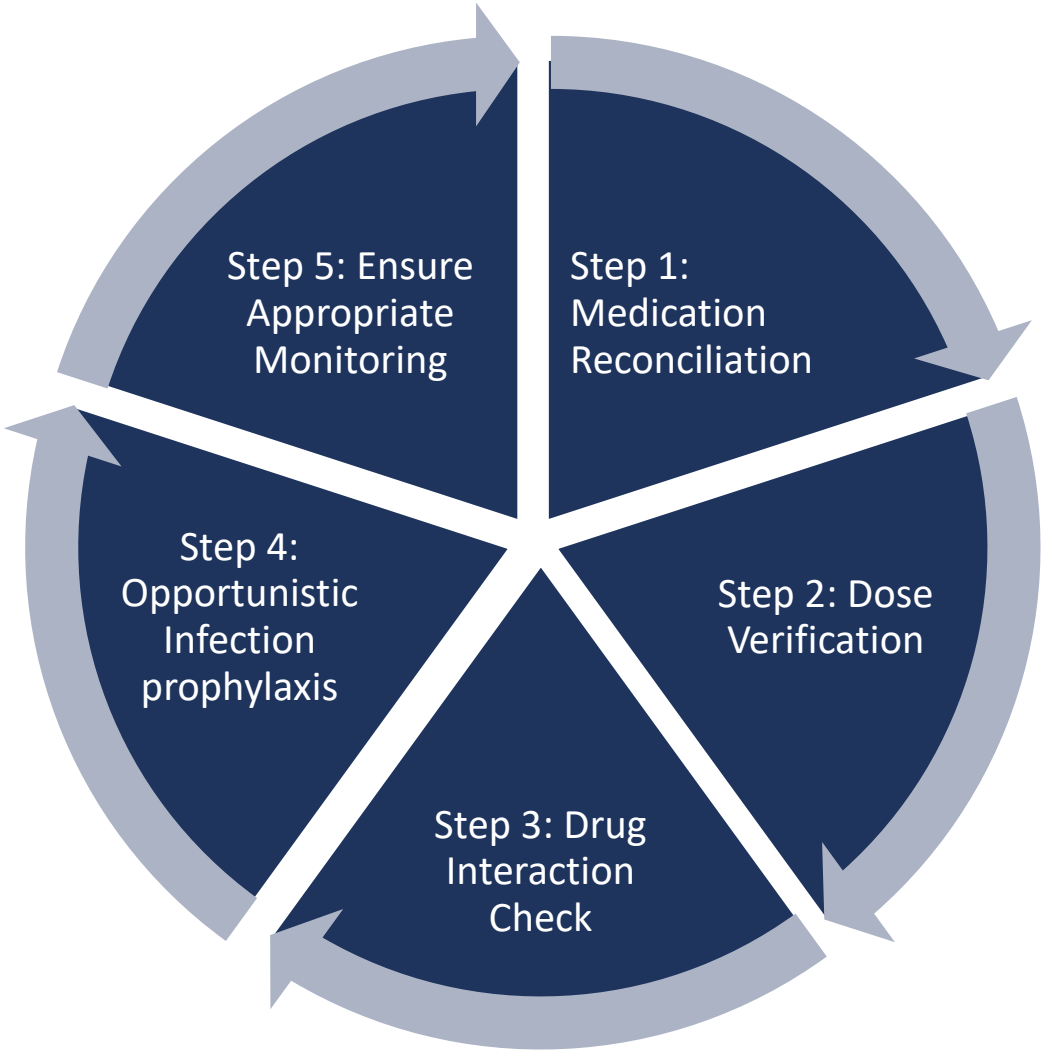
Guidelines



Antiretroviral Drug Resource

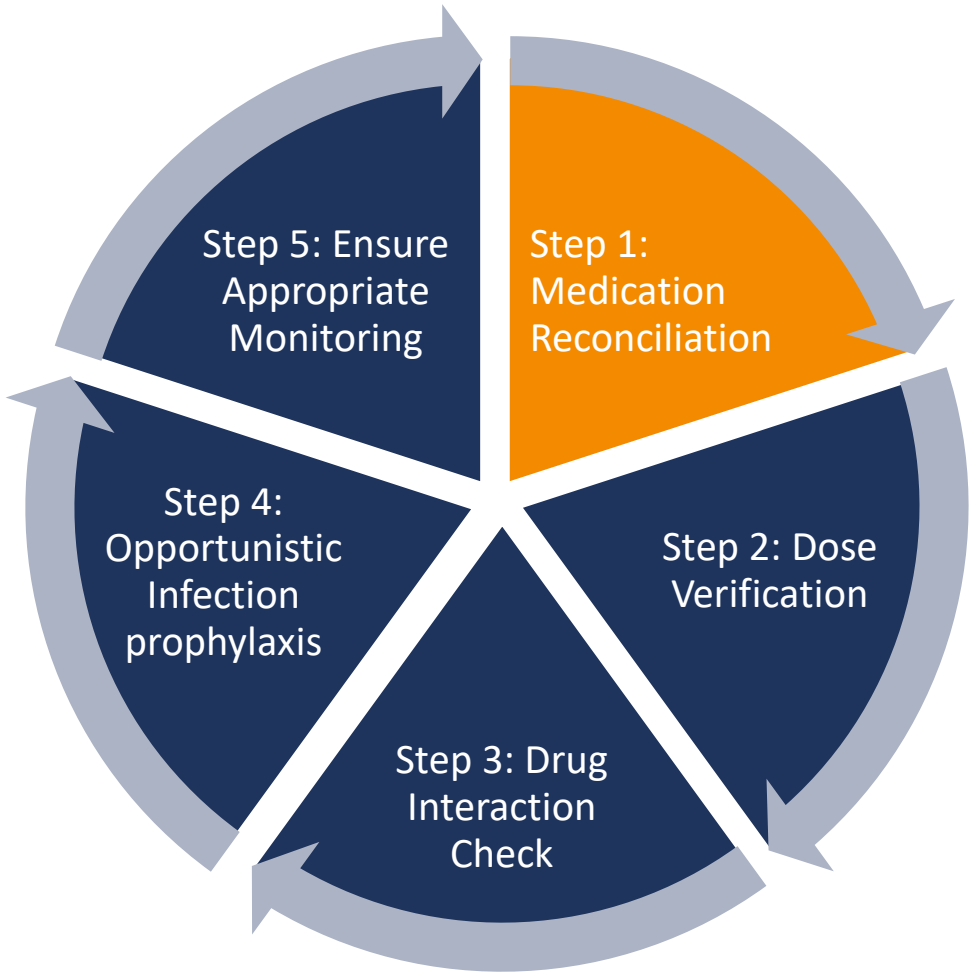
HEALTHTRUST UNIVERSITY CONFERENCE

Stepwise Approach to Reviewing Antiretroviral Orders



Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85.

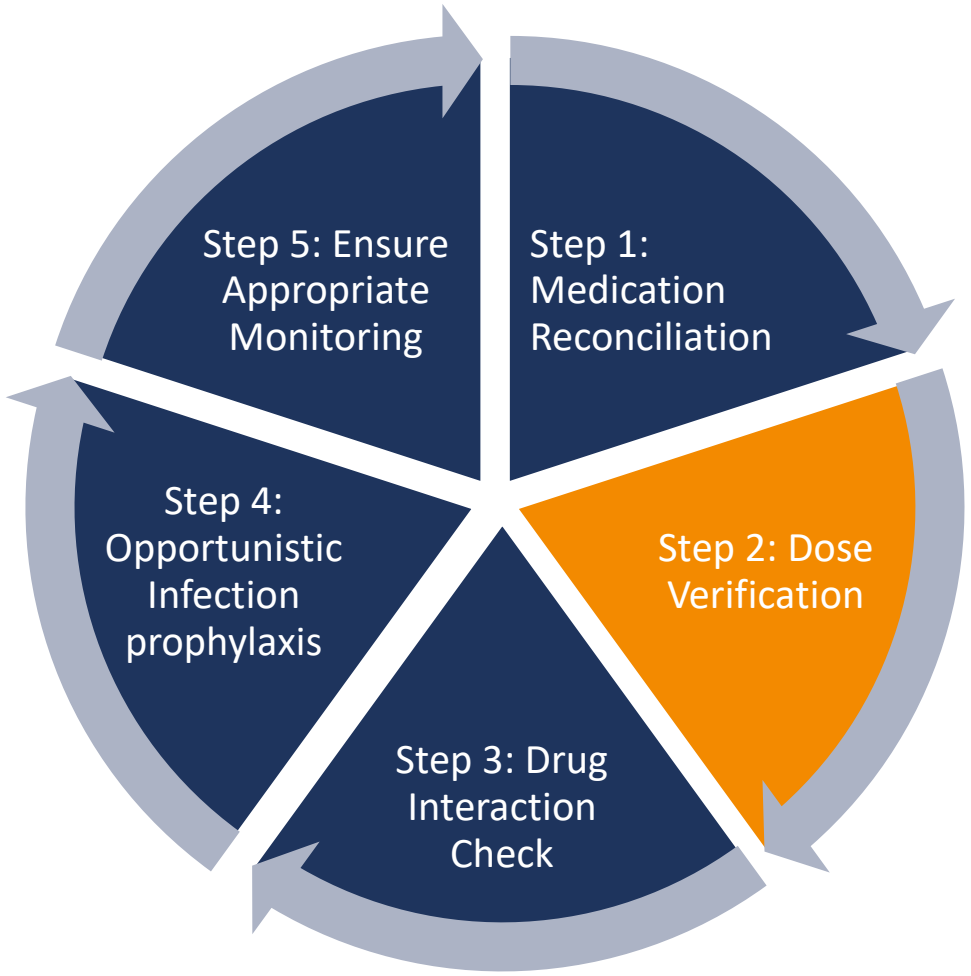
Step 1: Medication Reconciliation



- Be on the look out for **Incomplete Regimens**
  - **3 - drug regimen** from at least **two different classes**
  - Example
    - 2 - Nucleoside reverse transcriptase inhibitor (NRTI)
      - Tenofovir + Emtricitabine
      - Abacavir + Lamivudine
    - Integrase strand transfer inhibitor (INSTI)
      - Bictegravir
      - Dolutegravir
      - Elvitegravir
      - Raltegravir
  - Be on the look out for **boosters**
    - Protease Inhibitors (PI) are often boosted with cobicistat or ritonavir
- If patient can't remember or unable to provided names
  - Verify with outpatient pharmacy or clinic
  - Ask the patient if knows what it looks like

Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85.

Step 2: Dose Verification

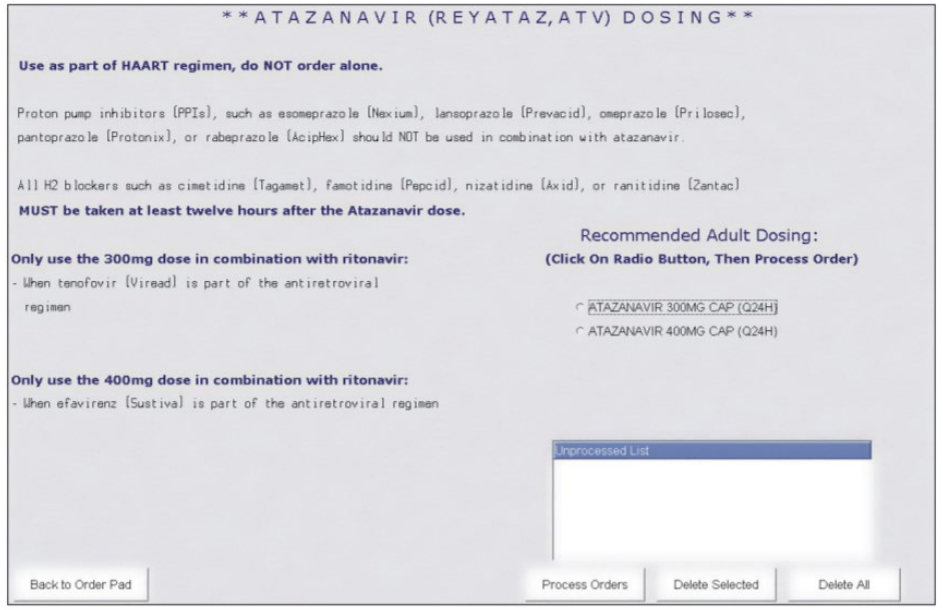


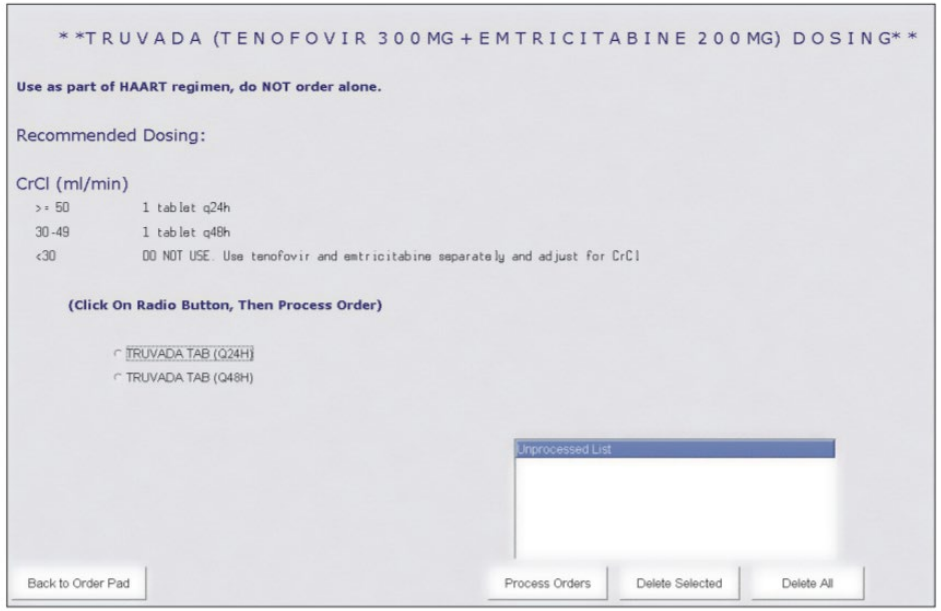
- Ordered the right drug
  - Ex). Tenofovir alafenamide ≠ Tenofovir disoproxil fumarate
- Dosing is appropriate
  - Can verify with drug information resources or guidelines (Appendix B, Table 10)
- Assess need for renal or hepatic dose adjustments
- Ensure appropriate formulation
  - Ex). Lamivudine suspension is needed to make renal dose adjusted doses
  - Intubation may impact route
- Watch out with food requirements
- Timing of medication is crucial

Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85.

Computerized Provider Order Enter Order Strings

- Help flag about pertinent drug interactions / consideration
- Provide quick links to formulary items
  - Combination product
- Provide renal dose adjustment in renal time
- Can also pre-build drug files to recommendation regard administration
  - Ex). Take with food, take at bedtime





Guo, Y. et al. *P & T : a peer-reviewed journal for formulary management*, *40*(5), 353–360.

How to use the Guidelines for Renal Dose Adjustments

Appendix B, Table 11. Antiretroviral Dosing Recommendations in Persons with Renal or Hepatic Insufficiency
(Last updated June 3, 2021; last reviewed June 3, 2021) (Page 2 of 10)

Generic Name (Abbreviations) *Trade Name*	Usual Dose[a]	Dosing in Persons with Renal Insufficiency			Dosing in Persons with Hepatic Impairment
NRTIs, *continued*					
Emtricitabine (FTC) *Emtriva*	FTC 200-mg oral capsule once daily *or* FTC 240-mg (24-mL) oral solution once daily	**Dose by Formulation**			No dose recommendation.
		CrCl (mL/min)	**Capsule**	**Solution**	
		30–49	200 mg every 48 hours	120 mg every 24 hours	
		15–29	200 mg every 72 hours	80 mg every 24 hours	
		<15	200 mg every 96 hours	60 mg every 24 hours	
		On HD[c]	200 mg every 24 hours	240 mg every 24 hours	
Lamivudine[b] (3TC) *Epivir*	3TC 300-mg PO once daily *or* 3TC 150-mg PO twice daily	**CrCl (mL/min)**	**Dose**		No dose adjustment necessary.
		15–29	1 × 150 mg, then 100 mg every 24 hours		
		5–14	1 × 150 mg, then 50 mg every 24 hours		
		<5 or on HD[c]	1 × 50 mg, then 25 mg every 24 hours		
Tenofovir Alafenamide (TAF) *Vemlidy*	Vemlidy is available as a 25-mg tablet for the treatment of HBV.	**CrCl (mL/min)**	**Dose**		*Child-Pugh Class B or C*: **Not recommended**
		<15 and not on HD	**Not recommended**		
		On HD[c]	One tablet PO once daily.		

Panel on Antiretroviral Guidelines for Adults and Adolescents. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/AdultandAdolescentGL.pdf. Accessed (6/15/2021).

Resources for Crushing Antiretrovirals

Canadian Recommendation

ORAL ANTIRETROVIRAL/HCV DAA ADMINISTRATION: INFORMATION ON CRUSHING AND LIQUID DRUG FORMULATIONS

Drug	Oral Liquid Preparation			Case Reports/Clinical Compounding	Information on Crushing or Splitting Tablets
	Commercial Oral Liquid Available?	Formulation	Stability		
Combination Products:					
Atripla® (efavirenz/ emtricitabine/ tenofovir DF)	no	Consider use of Truvada® tabs and efavirenz caps as alternate formulations (see separate entries)		Atripla® tablet was crushed, dissolved in 5 mL of water and diluted to 20 mL with Ora-Sweet oral vehicle. The solution was prepared within 24 hours of administration to ensure drug stability in solution. Bioequivalence of Atripla® tablet and compounded oral liquid formulation (above) in HIV-negative volunteers was **not** demonstrated. The 90% CI	See information on crushing Atripla® in the Case Reports section. Although Truvada® tablets may be split, splitting Atripla® tablets has not been studied. There are no studies evaluating the pharmacokinetics of a split tablet vs. a whole tablet. Efavirenz is not water soluble.

www.hiv-druginteraction.org

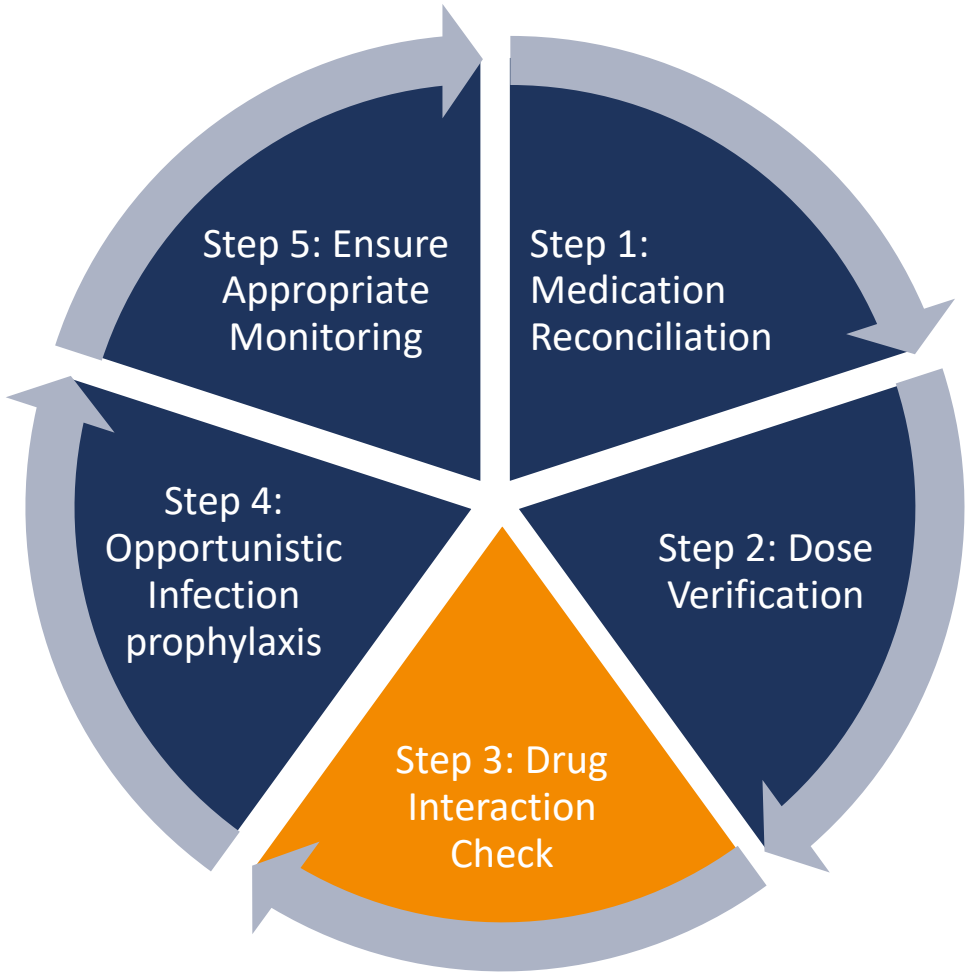
www.hiv-druginteractions.org

Antiretroviral Formulations for Swallowing Difficulties

Revised December 2018. *Page 1 of 4*

ARVs	Trade Name	Tablets/Capsules	Oral Solution or Powder or Other
Abacavir	Ziagen	Tablets can be crushed and added to a small amount of semi-solid food or liquid and taken immediately.	**Oral Solution** • Dosing is the same for oral solution and tablets.
Abacavir + Lamivudine	Kivexa Epzicom	Tablets should not be crushed as separate abacavir and lamivudine solutions are available. *[EACS Guidelines, version 9.1, 2018]*	
Abacavir + Lamivudine + Zidovudine	Trizivir	Tablets should not be crushed as abacavir, lamivudine and zidovudine solutions are available. *[EACS Guidelines, version 9.1, 2018]*	
Atazanavir	Reyataz	Capsules should be swallowed whole. Do not open the capsules.	**Oral Powder** • It is preferable to mix with food such as apple sauce or yogurt, however, it can be mixed with milk, infant formula, or water for infants who can drink from a cup, or mixed with infant formula and given using an oral dosing syringe to young infants (<6 months) who cannot eat solid food or drink from a cup. Using an infant bottle is not recommended as the full dose may not be delivered.

Step 3: Drug Interaction Check



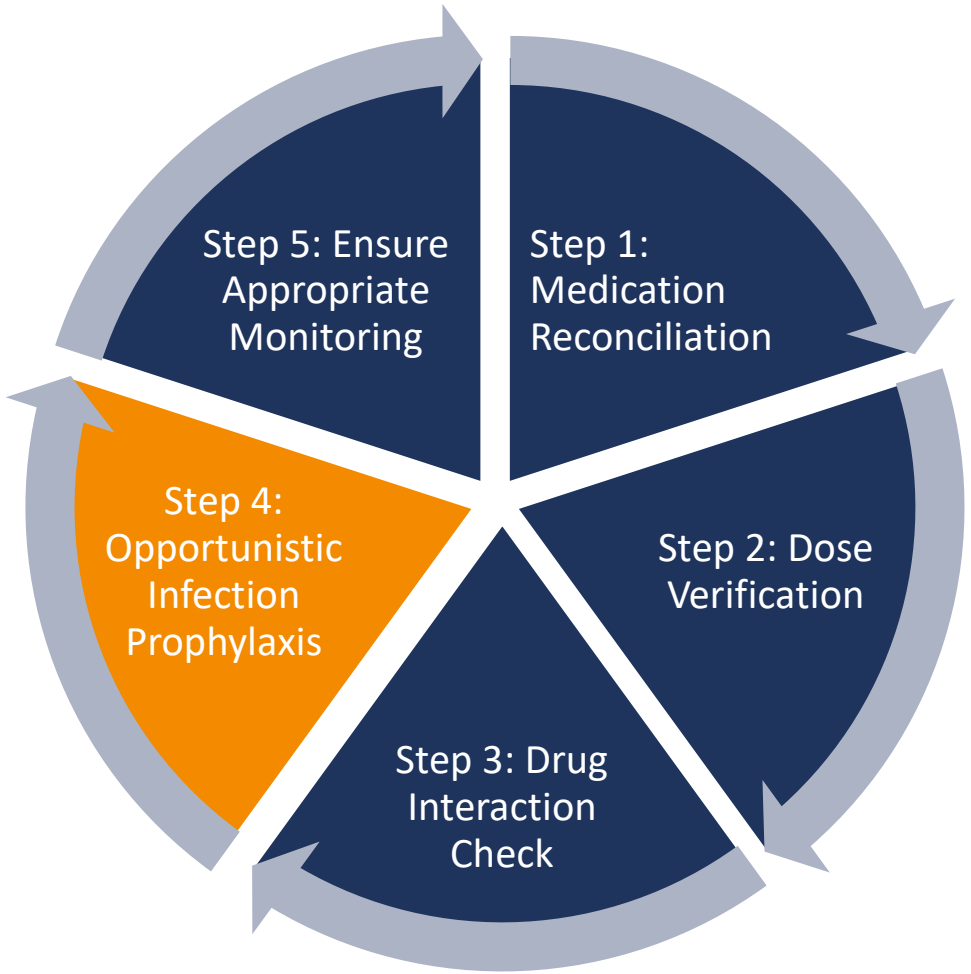
- Screening for drug interaction
  - Normal drug interaction resources
- If a drug interaction is identified
  - Go to guidelines
- Guidelines provide specific recommendations on how to handle almost all drug interaction

How to use the Guidelines for Drug – Interaction Recommendations

Table 24a. Drug Interactions Between Protease Inhibitors and Other Drugs
(Last updated June 3, 2021; last reviewed June 3, 2021) (page 2 of 28)

Concomitant Drug	PI	Effect on PI and/or Concomitant Drug Concentrations	Dosing Recommendations and Clinical Comments
Acid Reducers, *continued*			
H2 Receptor Antagonists, *continued*			If using TDF and H2RA in ART-experienced patients, administer ATV 400 mg plus RTV 100 mg with food simultaneously with and/or ≥10 hours after the dose of H2RA. **Do not coadminister** ATV/c with TDF and H2RA in ART-experienced patients.
	DRV/c, DRV/r, LPV/r	**With Ranitidine:** • ↔ DRV/r ↔ PI expected	No dose adjustment needed.
Proton Pump Inhibitors	ATV (unboosted)	**With Omeprazole 40 mg:** • ATV AUC ↓ 94%	**Do not coadminister.**
	ATV/c, ATV/r	**With Omeprazole 40 mg:** • ATV AUC ↓ 76% **When Omeprazole 20 mg is Given 12 Hours Before ATV/c or ATV/r:** • ATV AUC ↓ 42%	PPI dose should not exceed a dose equivalent to omeprazole 20 mg daily in PI-naive patients. PPIs should be administered at least 12 hours before ATV/c or ATV/r. **Do not coadminister in PI-experienced patients.**
	DRV/c, LPV/r	↔ PI expected	No dose adjustment needed.
	DRV/r	↔ DRV/r Omeprazole AUC ↓ 42%	Consider alternative ARV or acid reducer. If coadministered, monitor for omeprazole efficacy. If the patient does not experience symptomatic relief, increase the dose to no more than omeprazole 40 mg daily.

Step 4: Opportunistic Infection Prophylaxis Evaluation

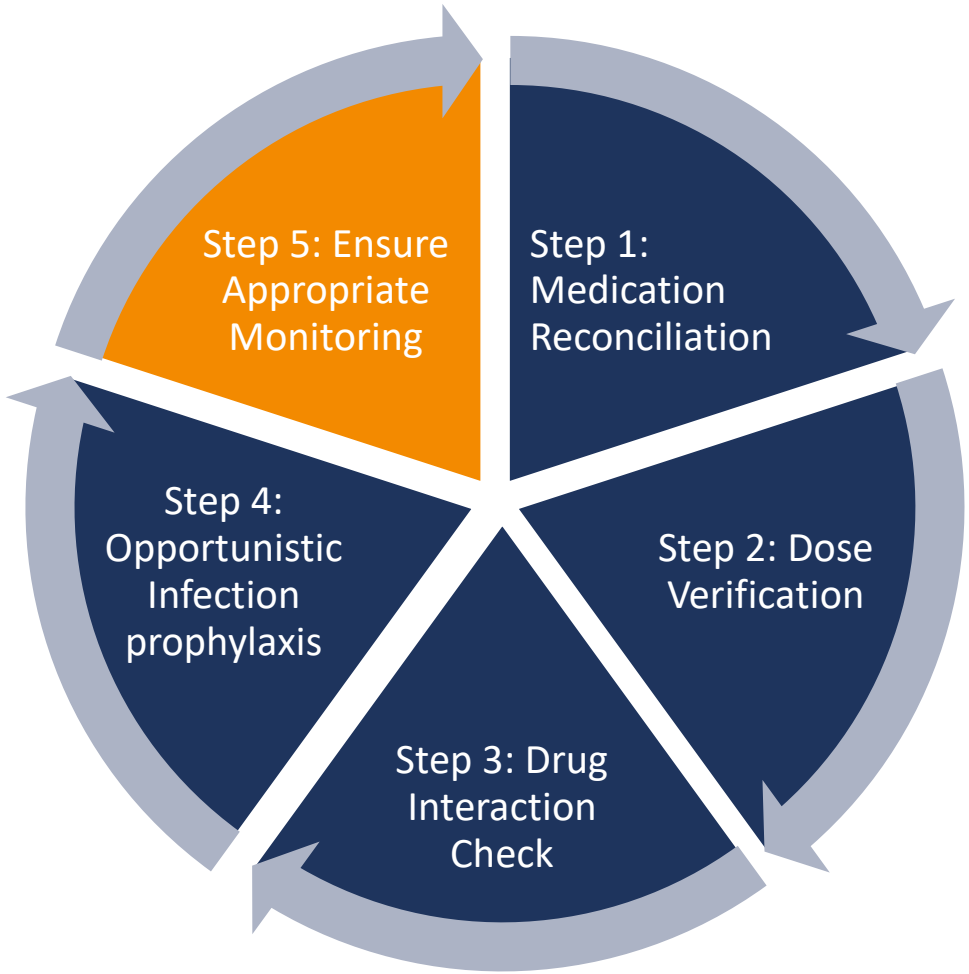


Evaluate a patient's CD4 count for need for prophylaxis

Opportunistic Infection	Indication	Primary Prophylaxis
Pneumocystis jirovecii Pneumonia (PJP)	• CD4 count <200 cells/mm^3 (AI) OR Oropharyngeal candidiasis (AII) • CD4 cell percentage of <14% OR history of an AIDS-defining Illness (BII)	TMP-SMX 1 (DS) PO daily (AI), or TMP-SMX 1 SS daily (AI) or TMP-SMX 1 (DS) 3 times weekly (BI)
Toxoplasma gondii Encephalitis (TE)	• Toxoplasma IgG positive patients with CD4 count <100 cells/mm^3 (AII)	TMP-SMX 1 DS PO daily (AII)
Disseminated Mycobacterium avium Complex Disease (MAC)	• CD4 count <50 cells/mm^3 **after ruling out disseminated MAC disease** based on clinical assessment (AI)	Azithromycin 1200 mg PO once weekly (AI) Clarithromycin 500 mg PO BID (AI)

Shea KM, et al. Am J Health Syst Pharm 2018; 75:876–85.
Panel on Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/adult_oi.pdf. Accessed (6/9/2021)

Step 5: Ensure Appropriate Monitoring



- Check back frequently for
  - Initiation of new therapy
    - Assess for drug interactions
    - Reassess the timing
  - Changes in renal or hepatic function
  - Clinical deterioration
    - Need to transition to per tube
- Monitor for adverse events
  - Table 17 from the guidelines

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Assessment Question #2 of 3

What would be the best resource to use to find information on how to manage a drug-interaction with an antiretroviral?

a. Package insert
b. Sanford guide
c. Clinical Info HIV Guidelines APP
d. General drug information resource

Assessment Question #2: Correct Response

What would be the best resource to use to find information on how to manage a drug-interaction with an antiretroviral?

a. Package insert

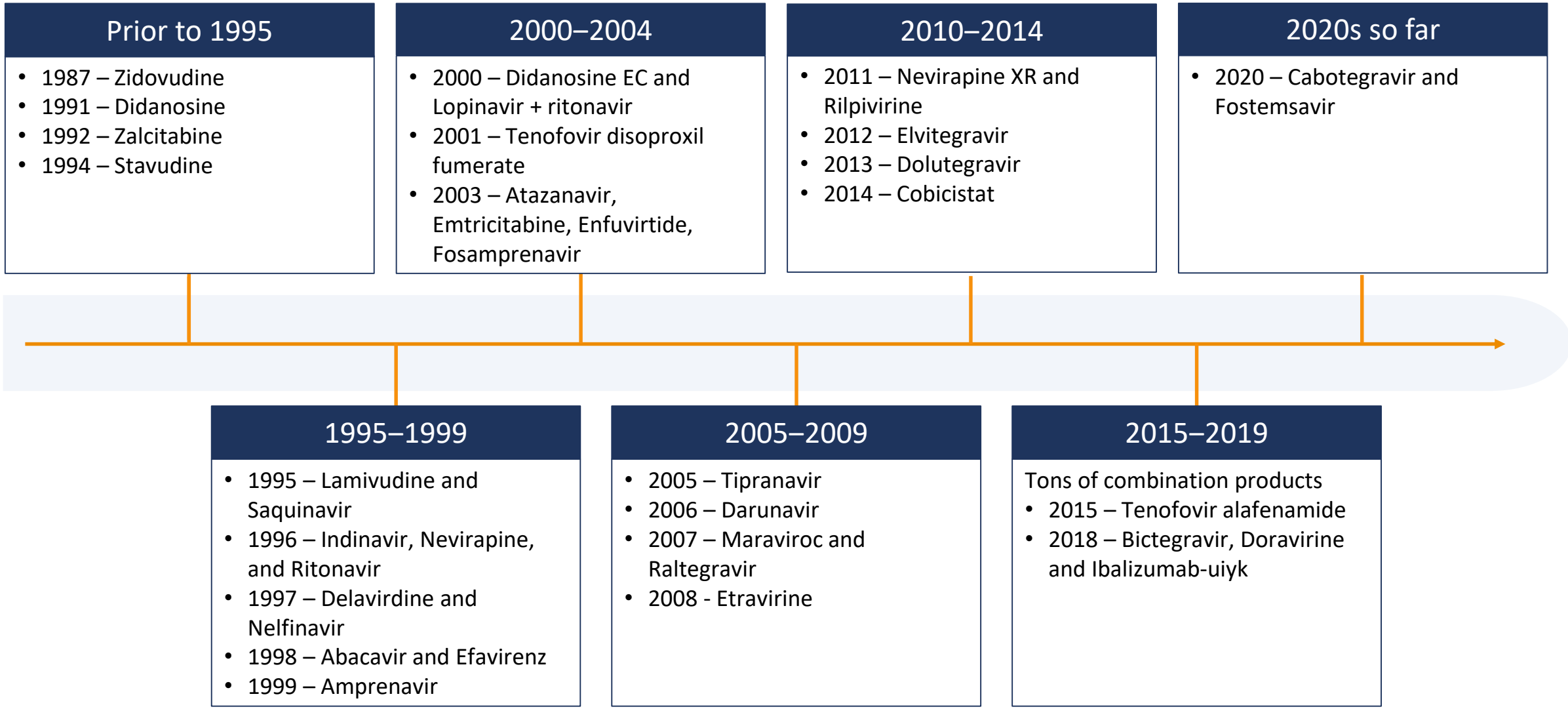
b. Sanford guide

c. Clinical Info HIV Guidelines APP

d. General drug information resource

Formulary Management of Antiretrovirals

Available Antiretrovirals (excluding combination products)



https://hivinfo.nih.gov/understanding-hiv/infographics/fda-approval-hiv-medicines

Approaches for Managing an Antiretroviral Formulary

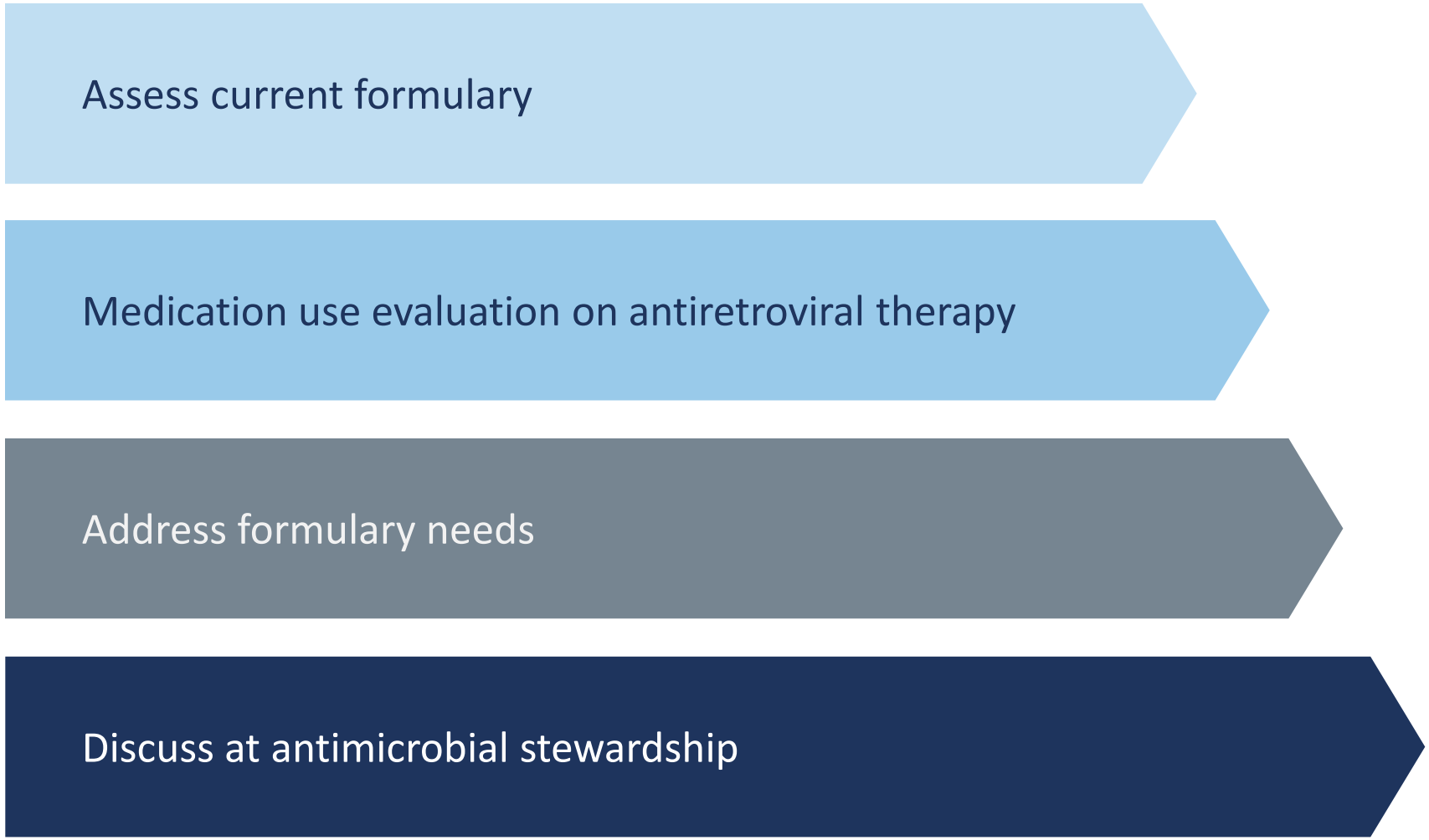
Patient Own Supply

- Use patient own medication while they are admitted
- Benefits
  - Patient medication will be the same
  - Limits the amount of medication need to be kept on formulary
- Downsides
  - Need a plan on how to handle if patient does not have their home medications or home medication run out
  - Can be more time intensive to process
  - Drug-interaction software may not appropriately capture drug-interactions

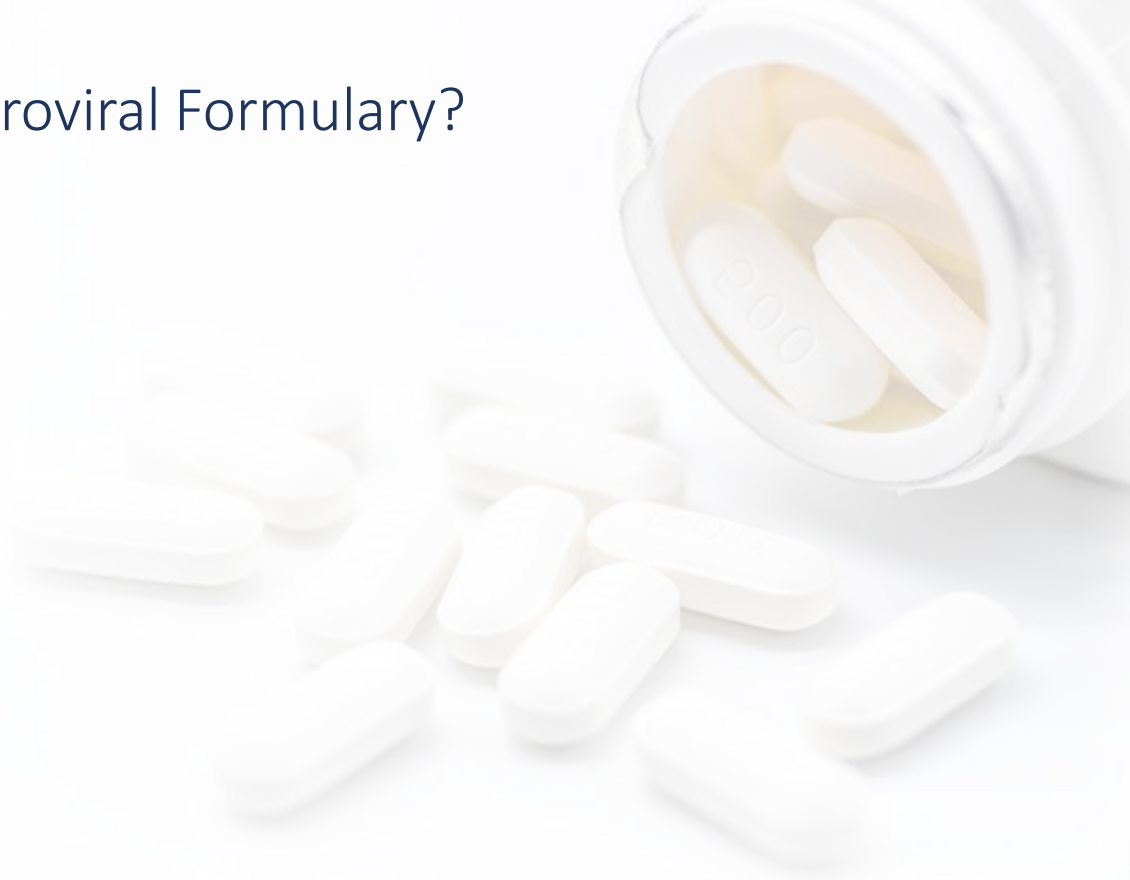
Interchange Combination Products

- Limit the number of combination products on formulary
- Use individual components to make products
- Benefits
  - Formulary is adaptive
  - Turnover of individual component is improved
- Downsides
  - More medications are needed
  - High pill burden for the patient
  - Patient may be concerned that product does not look the same

Process for Reviewing Hospitals Antiretroviral Formulary



What to Look for When Reviewing Hospitals Antiretroviral Formulary?



- Antiretrovirals about to expire
- Duplicative formulations / medications
  - Ritonavir has 3 formulations
    - Capsule
    - Solution
    - Powder for solution
- Missing formulations / medications
  - Lamivudine suspension
  - IV zidovudine
  - Post exposure prophylaxis regimen (Raltegravir + Tenofovir + Lamivudine)
- Availability of individual medications to make combination products
- Have there been any issues the previous year

Consideration for Antiretroviral Formulary

- Post-exposure prophylaxis
  - Raltegravir + Tenofovir Disoproxil Fumarate + Emtricitabine
- Hospitals with Obstetrics
  - Intrapartum IV Zidovudine
- Pediatrics
  - Often requires more liquid formations to make doses
- Some products only come as combination products
  - Bictegravir
  - Elvitegravir

Kuhar, D, et al. *Infection Control and Hospital Epidemiology, 34*(9), 875-892. doi:10.1086/672271
Panel on Treatment of Pregnant Women with HIV Infection and Prevention of Perinatal Transmission. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/PerinatalGL.pdf. Accessed (6/9/2021)
Panel on Antiretroviral Therapy and Medical Management of Children Living with HIV. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/pediatricguidelines.pdf. Accessed (6/9/2021)

Antiretroviral Medication Use Evaluation

- Look at day of therapy (DOT) or defined daily doses (DDD)

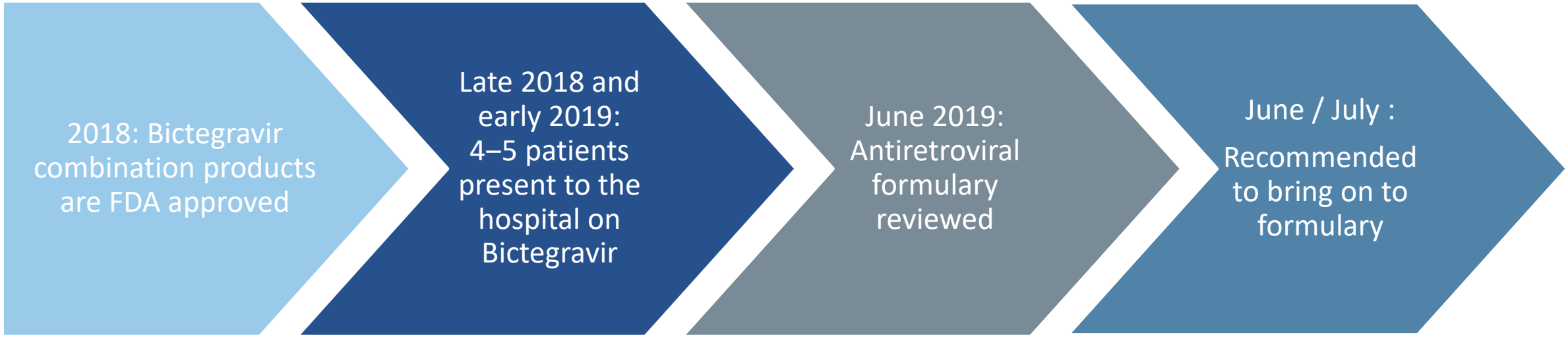
- Review frequently used products
  - Are there any duplications?
  - Are there opportunities for substitution?
    - Combination products
  - Are there products that are not being using?
  - Are there products that are not commonly used anymore?
  - Are there products that are not turning over before they expire?

Assessing Formulary Needs & Discussing with Antimicrobial Stewardship Team

- Assessing formulary needs
  - Results of medication use evaluation
  - Review newly approved products

- Discussing with Antimicrobial Stewardship Team
  - Review current formulary
  - Discuss findings of the medication use evaluation
  - Discuss new therapy and potential clinical need
  - Make recommendations

Example



Recommendation:

- Add to formulary for continuation of outpatient therapy
- Restricted to infectious disease providers for initiation of therapy in newly diagnosed patients

Assessment Question: #3 of 3

What are some benefits for interchanging combinations products when managing an antiretroviral formulary?

a. Patient medications will be the same
b. High pill burden for the patient
c. Uses the patient's own medications while they are admitted
d. An adaptive formulary

Assessment Question #3: Correct Response

What are some benefits for interchanging combinations products when managing an antiretroviral formulary?

a. Patient medications will be the same
b. High pill burden for the patient
c. Uses the patient's own medications while they are admitted
d. An adaptive formulary

Putting All Together

Antiretrovirals are a problematic class drugs in the United States

Medication errors with antiretroviral therapy are often missed in patients in hospitalized with HIV

Prospective systematic reviews of antiretroviral therapy is an effective to ensure safe antiretroviral administration

Developing processes to review a hospital's antiretroviral formulary is a crucial of any antiretroviral stewardship program

References

1. David E Koren, Kimberly K Scarsi, Eric K Farmer, Agnes Cha, Jessica L Adams, Neha Sheth Pandit, Jennifer Chang, James Scott, W David Hardy, A Call to Action: The Role of Antiretroviral Stewardship in Inpatient Practice, a Joint Policy Paper of the Infectious Diseases Society of America, HIV Medicine Association, and American Academy of HIV Medicine, *Clinical Infectious Diseases*, Volume 70, Issue 11, 1 June 2020, Pages 2241–2246, https://doi.org/10.1093/cid/ciz792
2. Society for Healthcare Epidemiology of America, Infectious Diseases Society of America, and Pediatric Infectious Diseases Society. Policy statement on antimicrobial stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS). *Infect Control Hosp Epidemiol* 2012; 33:322 –7 doi: 10.1086/665010. PMID: 22418625.
3. Paterson DL, Swindells S, Mohr J, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. Ann Intern Med. 2000;133:21–30. [PubMed: 10877736]
4. Arnsten JH, Demas PA, Grant RW, et al. Impact of active drug use on antiretroviral therapy adherence and viral suppression in HIV-infected drug users. J Gen Intern Med. 2002;17:377–381. [PubMed: 12047736]
5. Bangsberg DR, Hecht FM, Charlebois ED, et al. Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. AIDS. 2000;14:357–366. [PubMed: 10770537]
6. Pharmacy Quality Alliance. PQA's specialty core measure set. Available at https://www.pqaalliance.org/assets/Measures/PQA_HIV_Measure_Overview.pdf Accessed May 20th, 2021
7. Cheng, Y., Sauer, B., Zhang, Y., Nickman, N.A., Jamjian, C., Stevens, V., LaFleur, J., & Chaurasia., A. (2018, January). Adherence and virologic outcomes among treatment-naive veteran patients with human immunodeficiency virus type 1 infection. Medicine, 97(2), e9430. https://doi.org/10.1097/MD.0000000000009430
8. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV. Department of Health and Human Services. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/AdultandAdolescentGL.pdf. Accessed (6/15/2021).
9. Raboud J, Li M, Walmsley S, et al. Once daily dosing improves adherence to antiretroviral therapy. AIDS Behav. Oct 2011;15(7):1397-1409. Available at http://www.ncbi.nlm.nih.gov/pubmed/20878227.
10. Nachega JB, Parienti JJ, Uthman OA, et al. Lower pill burden and once-daily antiretroviral treatment regimens for HIV infection: A meta-analysis of randomized controlled trials. *Clin Infect Dis.* May 2014;58(9):1297-1307. Available at https://www.ncbi.nlm.nih.gov/pubmed/24457345.
11. Clay PG, Nag S, Graham CM, Narayanan S. Meta-analysis of studies comparing single and multi-tablet fixed dose combination HIV treatment regimens. *Medicine.* Oct 2015;94(42):e1677. Available at https://www.ncbi.nlm.nih.gov/pubmed/26496277.
12. Chiampas TD, Kim H, Badowski M. Evaluation of the occurrence and type of antiretroviral and opportunistic infection medication errors within the inpatient setting. Pharm Pract (Granada) 2015; 13:512.
13. Li EH, Foisy MM. Antiretroviral and medication errors in hospitalized HIV positive patients. Ann Pharmacother 2014; 48:998–1010.
14. Liedtke MD, Tomlin CR, Skrepnek GH, Farmer KC, Johnson PN, Rathbun RC. HIV pharmacist's impact on inpatient antiretroviral errors. HIV Med 2016; 17:717–23.
15. Yehia BR, Mehta JM, Ciuffetelli D, et al. Antiretroviral medication errors remain high but are quickly corrected among hospitalized HIV-infected adults. Clin Infect Dis 2012; 55:593–9

References, *continued*

16. Shea KM, Hobbs AL, Shumake JD, Templet DJ, Padilla-Tolentino E, Mondy KE. Impact of an antiretroviral stewardship strategy on medication error rates. Am J Health Syst Pharm 2018; 75:876–85.
17. Heelon M, Skiest D, Tereso G, et al. Effect of a clinical pharmacist's interventions on duration of antiretroviral-related errors in hospitalized patients. Am J Health Syst Pharm 2007; 64:2064–8.
18. Liedtke MD, Tomlin CR, Skrepnek GH, Farmer KC, Johnson PN, Rathbun RC. HIV pharmacist's impact on inpatient antiretroviral errors. HIV Med 2016; 17:717–23.
19. Bias TE, Venugopalan V, Berkowitz LB, et al. Incidence of antiretroviral drug interactions during hospital course: the role of a pharmacist-led antiretroviral stewardship program. J Pharm Tech 2014; 30:48–53.
20. DePuy AM, Samuel R, Mohrien KM, Clayton EB, Koren DE. Impact of an antiretroviral stewardship team on the care of patients with human immunodeficiency virus infection admitted to an academic medical center. Open Forum Infect Dis 2019; 6:ofz290
21. Billedo JA, Berkowitz LB, Cha A. Evaluating the impact of a pharmacist-led antiretroviral stewardship program on reducing drug interactions in HIV-infected patients. J Int Assoc Provid AIDS Care 2016; 15:84–8.
22. Sanders J, Pallotta A, Bauer S, et al. Antimicrobial stewardship program to reduce antiretroviral medication errors in hospitalized patients with human immunodeficienc virus infection. Infect Control Hosp Epidemiol 2014; 35:272–7.
23. Zucker J, Mittal J, Jen SP, Cheng L, Cennimo D. Impact of stewardship interventions on antiretroviral medication errors in an urban medical center: a 3-year, multiphase study. Pharmacotherapy 2016; 36:245–51.
24. Batra R, Wolbach-Lowes J, Swindells S, et al. Impact of an electronic medical record on the incidence of antiretroviral prescription errors and HIV pharmacist reconciliation on error correction among hospitalized HIV-infected patients. Antivir Ther 2015; 20:555–9.
25. Carcelero E, Tuset M, Martin M, et al. Evaluation of antiretroviral-related errors and interventions by the clinical pharmacist in hospitalized HIV-infected patients. HIV Med 2011; 12:494–9.
26. Daniels LM, Raasch RH, Corbett AH. Implementation of targeted interventions to decrease antiretroviral-related errors in hospitalized patients. Am J Health Syst Pharm 2012; 69:422–30.
27. Eginger KH, Yarborough LL, Inge LD, Basile SA, Floresca D, Aaronson PM. Medication errors in HIV-infected hospitalized patients: a pharmacist's impact. Ann Pharmacother 2013; 47:953–60.
28. Lauzevis S, Chaix F, Lazzerini C. Evaluation of a strategy aimed at reducing errors in antiretroviral prescriptions for hospitalized HIV-infected patients. Med Mal Infect 2013; 43:391–7.
29. Guo, Y., Chung, P., Weiss, C., Veltri, K., & Minamoto, G. Y. (2015). Customized order-entry sets can prevent antiretroviral prescribing errors: a novel opportunity for antimicrobial stewardship. P & T : a peer-reviewed journal for formulary management, 40(5), 353–360.

References, *continued*

31. Panel on Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the Prevention and Treatment of Opportunistic Infections in HIV-infected Adults and Adolescents: Recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/adult_oi.pdf. Accessed (6/9/2021)
32. Kuhar, D., Henderson, D., Struble, K., Heneine, W., Thomas, V., Cheever, L., . . . US Public Health Service Working Group. (2013). Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis. Infection Control and Hospital Epidemiology, 34(9), 875-892. doi:10.1086/672271
33. Panel on Treatment of Pregnant Women with HIV Infection and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs in Pregnant Women with HIV Infection and Interventions to Reduce Perinatal HIV Transmission in the United States. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/PerinatalGL.pdf. Accessed (6/9/2021)
34. Panel on Antiretroviral Therapy and Medical Management of Children Living with HIV. Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection. Available at https://clinicalinfo.hiv.gov/sites/default/files/inline-files/pediatricguidelines.pdf. Accessed (6/9/2021)

Thank you…

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Clinical Evidence Summary

Endoscopic Vein Harvesting

This Clinical Evidence Summary was developed to provide a synopsis of the current clinical literature and study data specific to products available in the United States for Endoscopic Vein Harvesting (EVH).

More than 200,000 coronary artery bypass graft (CABG) surgeries are performed annually in the United States.[1] One key to the success of a CABG surgery is to ensure a quality graft/conduit to bypass the diseased vessel.[2] Graft selection and method of harvesting play an important role in successful short-term and long-term outcomes.[3] Endoscopic Vein Harvesting (EVH), introduced in the mid-1990s, is a minimally-invasive procedure for harvesting the saphenous vein to use as a graft for CABG.[3]

Performed through a three (3) cm incision just above the medial aspect of the knee, 35 cm of the thigh saphenous vein may be harvested.[3] If a 70 cm length of vein is needed, there is an option to repeat the procedure using the same incision in the opposite direction or begin the harvesting procedure 2-5 cm above the medial malleolus, followed by a second incision just above the knee to harvest the entire length of the saphenous vein. The vein is identified and the tunnel is either craved with a balloon (closed tunnel system) or left open (open tunnel system) and the tunnel is insufflated with carbon dioxide. Videoscopic visualization is used to advance the conical dissection cone or spoon-shaped dissector tip toward the groin. Once circumferential blunt dissection of the vein is completed the collateral branches are isolated and divided with bipolar electrocautery. Ligation is performed through a stab and graft incision.[3]

EVH is the preferred method over traditional SVG harvesting, which involves creating a long incision along the medial part of the lower leg or thigh.[3] There are significant advantages for EVH, including reduction in leg wound complications, ameliorated postoperative pain and improved cosmetic outcomes, resulting in increased patient satisfaction.[3]

Professional Society Statements

Three professional society statements recommend use of arterial grafts over saphenous vein graft (SVG) in CABG procedures; particularly for the left coronary system.[4,5,6] Guidelines support using the left internal mammary artery (LIMA) as the primary graft for a left anterior descending (LAD) target vessel (Class 1 LOE B per STS). Consideration for bilateral (IMA) in patients with low risk for sternal complications is a secondary conduit recommendation

Summary

- Current professional society guidelines favor the use of arteries rather than veins for secondary conduit in CABG; however, SVG seems to be the conduit of choice for secondary graft with many surgeons.
- EVH is a minimally-invasive procedure for harvesting the saphenous vein to use as a graft for CABG.
- EVH is performed using CO_2 insufflation in a closed tunnel system or open tunnel system.
- EVH (closed or open) is the preferred method over open vein harvesting due to the reduction in leg wound complications, decreased post-operative pain and cosmetic outcomes—all leading to improved patient satisfaction.
- Studies and professional guidelines have revealed the safety and efficacy of EVH in harvesters with proper training and experience.
- EVH, (closed and open) when properly used, demonstrates outcomes that are similar to open procedures with regard to MACE.

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