



Antimicrobial Use Metrics: Measure Up Your Stewardship

Antimicrobial stewardship is a collaborative effort to improve how antimicrobials prescribed by clinicians and used by patients. Measurement of antimicrobial use before and after intervention are some of key activities of antimicrobial stewardship programs.

How do we measure antimicrobial use: days of therapy vs defined daily dose vs length of therapy?

	Days of therapy (DOT) ^{1,2}	Defined daily dose (DDD) ^{1,2}	Length of therapy (LOT) ^{1,2}
Definition	<ul style="list-style-type: none"> Measurement of antimicrobial exposure DOT is the count of number of individual antimicrobial agents given to a patient on each day 	<ul style="list-style-type: none"> Measurement of antimicrobial consumption standardized by World Health Organization's (WHO) DDD "correction factor" WHO's DDD "correction factor" = average daily maintenance dose for main indications for adults 	Days of antimicrobial exposure irrespective of the number of antimicrobials administered (measure duration of therapy)
Advantage	<ul style="list-style-type: none"> Not influenced by changes in recommended DDD or preferred daily dose Can be used in children 	Allow estimate use in situation where there is limited computerized pharmacy data (e.g. have tonnage of drug used data, purchasing data)	Evaluate duration of therapy (not influenced by number of antimicrobial agents)
Disadvantage	<ul style="list-style-type: none"> Overestimate use for drugs given multiple doses per day More difficult to measure without administered/computerized pharmacy records 	<ul style="list-style-type: none"> Underestimate use in renal impaired patients Does not accurately estimate DOT when administered daily dose is not equal to WHO's DDD "correction factor" Approved WHO's DDD "correction factor" may change 	Does not reflect the number of antimicrobial agents used

Note: Antimicrobial use metrics (DOT vs DDD vs LOT) are often standardized per 1000-patient days to account for hospital/institution census

Example: Imagine three patients were treated for a complicated intra-abdominal infection at different hospitals.

At hospital A, the patient received cefepime 2 g q12h and metronidazole 500 mg q8h for 10 days

At hospital B, the patient received cefepime 2 g q8h and metronidazole 500 mg q8h for 10 days.

At hospital C, the patient received piperacillin-tazobactam 3.375 g q6h for 10 days.

Note: WHO cefepime DDD "correction factor" = 4 g, metronidazole DDD "correction factor" = 1.5 g, and piperacillin "correction factor" = 14 g.

	Days of therapy (DOT)	Defined daily dose (DDD)	Length of therapy (LOT)
Hospital A	10 (cefepime) + 10 (metronidazole) = 20	$\frac{2g \times 2}{4g} \times 10$ (cefepime) + $\frac{0.5g \times 3}{1.5g} \times 10$ (metronidazole) = 20	10
Hospital B	10 (cefepime) + 10 (metronidazole) = 20	$\frac{2g \times 3}{4g} \times 10$ (cefepime) + $\frac{0.5g \times 3}{1.5g} \times 10$ (metronidazole) = 25	10
Hospital C	10 (piperacillin-tazobactam) = 10	$\frac{3g \times 4}{14g} \times 10$ (piperacillin) = 8.57	10

Key takeaway: There are three common ways to measure aggregate antimicrobial use: days of therapy, defined daily doses, and length of therapy. Each specific measurement has its own advantages and disadvantages. Days of therapy is the most common way to measure antimicrobial use.

References:

- Ibrahim OM, Polk RE. Antimicrobial use metrics and benchmarking to improve stewardship outcomes: methodology, opportunities, and challenges. *Infect Dis Clin North Am.* 2014 Jun;28(2):195-214.
- Polk RE, Fox C, Mahoney A, Letcavage J, MacDougall C. Measurement of adult antibacterial drug use in 130 US hospitals: comparison of defined daily dose and days of therapy. *Clin Infect Dis.* 2007 Mar 1;44(5):664-70.