



balancing antibiotic treatment

treat



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The challenge



Bacterial infections are a frequent cause of death, but the risk of death can be substantially reduced by covering antibiotic therapy. Antibiotic treatment is in most cases initiated empirically, prior to identification of the causative pathogen. Appropriate treatment, that is matching in-vitro susceptibilities of subsequently isolated pathogens, reduces the overall fatality rate of severe infections with adjusted odds ratios between 1.6 and 6.9. In current clinical practice 20-50% of patients receive inappropriate empirical antibiotic treatment. No less of a problem are superfluous and

unnecessary antibiotic treatments. Concurrently, hospitals are facing a grave problem of antibiotic-resistant infections driven by excessive and inappropriate antibiotic use.

Thus in current practice we both undertreat patients, placing them at danger, and increase the problem of resistance by excessive and inappropriate antibiotic use.

Even the most common problems in antibiotic treatment do not have simple solutions. Choosing one antibiotic drug from among several candidates entails balancing the benefits and the costs associated with each.

In choosing antibiotic treatment, doctors have to choose between the interests of present and future patients. Should you prescribe a broad-spectrum antibiotic and thereby expecting to have covered the infection, or should you balance this with other consi-

derations like the risk of facing future bacterial resistance and direct economic costs?

Different perspectives may lead to different conclusions:

- Patients expect to be treated as good as possible with no considerations for future patients and economy in general.
- Doctors want to - and are expected to - treat each current patient as effectively as possible while not contributing to future bacterial resistance.
- Infection specialists, as well as the society, want to limit the likelihood of developing antibiotic resistance.
- Hospital management wants to limit expenses for antibiotic treatment as well as other costs in addition to common clinical goals.



Treat is a computer system that can be installed in your hospital. It runs on any available computer that is connected to the hospital intranet, using web-based technology to access a hospital-based **Treat** server.

The attending clinician will usually draw samples for culture from an infected patient in the hope that the pathogen(s) can be isolated from the samples. The laboratory results are

normally available one to two days later. Meanwhile, the clinician will institute the empirical antibiotic treatment based on the data available at the onset of the infection.

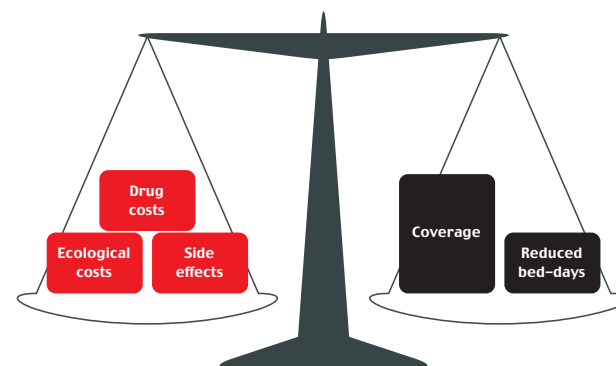
Treat can provide advice on empirical treatment at the onset of the infection and on semi-empirical treatment later, when the morphology and Gram stain of the pathogen is known.

Treat can do this because it is calibrated to each hospital with updated information on the prevalence of pathogens and their resistance to antibiotics.

Treat balances the cost and benefit of a treatment by a decision-theoretic approach.

Treat will help you through the phases of prescription of antibiotics:

- Is there a bacterial infection – how severe is it?
- Which site of infection?
- Which pathogens?
- Coverage by a given antibiotic?
- Balancing coverage of the treatment against drug expenditure, side effects and ecological cost



Your dilemma

You are a hospital doctor. A patient is admitted to your department. Based on clinical findings you decide that the patient has a severe urinary tract infection and needs intravenous antibiotic treatment.

But how do you treat a patient with a severe urinary tract infection - Gentamicin or a 4th generation cephalosporin ?

- Gentamicin because it is cheap and easy to administer to the patient?
- Cephalosporin because it gives higher coverage?
- Gentamicin because you want to reserve cephalosporins for the future and for cases where gentamicin fails?
- Cephalosporin because you believe the nephrotoxic effects of gentamicin makes it unsuited for urinary tract infections?

Saving lives – and money

In an observational trial at 3 major European hospitals covering antibiotic treatment was prescribed to 58% of patients by the clinicians, while **Treat**'s advice was covering in 70% of the cases. Furthermore, relative to the clinicians, **Treat** reduced drug expenditure to 53%, ecological cost to 41% and overall cost to 51%.

An interventional randomized controlled trial at the same 3 hospitals showed that clinicians with access to **Treat** achieved better coverage and lower costs and that a reduction of hospital days had been achieved. The rate of appropriate semi-empirical antibiotic treatment improved from 78% to 87%.

In both trials **Treat** preferred narrow-spectrum antibiotics. The overall cost at each site and the costs related by the model to future resistance were significantly reduced by **Treat**.

