



Nijmegen Institute for
Infection, Inflammation
& Immunity

How to audit antimicrobial prescriptions in a hospital

Inge C. Gyssens MD PhD

Radboud University Nijmegen Medical Centre

Canisius Wilhelmina Hospital

Nijmegen

The Netherlands

&

Hasselt University, Belgium



ESGAP
ESCMID STUDY GROUP
FOR ANTIBIOTIC POLICIES

Qualitative measurement: the in-depth audit

Outline

Definition

Topics for audit

The profile of the prescriber

Methodology

Quality measures- audit criteria

Illustrative case

Evaluation by whom?

Recommendations



AUDIT (& FEEDBACK)

WHAT IS?

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General Definition Audit & Feedback

Any summary of clinical performance of health care over a specified period of time aimed at changing health professional behaviour, as indexed by objectively measured professional practice in a healthcare setting or healthcare outcomes

Jamtvedt et al, 2006 in Gardner et al, Social Science and Medicine; 70: 2010

Social Science & Medicine 70 (2010) 1618–1625



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Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed



Using theory to synthesise evidence from behaviour change interventions: The example of audit and feedback

Benjamin Gardner^{a,*}, Craig Whittington^a, John McAteer^a, Martin P. Eccles^b, Susan Michie^a

^aCentre for Outcomes Research and Effectiveness, University College London, 1–19 Torrington Place, London WC1E 7HB, UK

^bNewcastle University, UK

Audit

Definition

An analysis of appropriateness of individual prescriptions

Gould IM et al. Hospital antibiotic control measures in the UK. J Antimicrob Chemother 1994; 34:21-42.

Audit: What it is not

- Surveillance of prescriptions at population level, ward, hospital...
- An inquiry of practices

Practice variation in perioperative antibiotic use in Japan

MIHO SEKIMOTO, YUICHI IMAI, JANE LEWYARD EVANS, TATSURO ISHIZAKI, MASAHIRO HIROSE, KENSHI HAYASHIDA AND TSUGUYA FUKUI¹

Our study has several limitations that must be acknowledged. Firstly, our study measured physicians' attitudes toward antimicrobial prophylaxis rather than their behaviors. A social desirability bias may have induced the physicians to report the practices they think they should perform rather than those they actually do. However, even if such a bias existed,

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Sekimoto et al. Int J Qual Health Care 2004;16: 367-73

Optimal Antibiotic use

Definition

- maximal efficacy
- minimal toxicity
- at reasonable cost
- minimal development of resistance

Inquiry versus Audit

- Inquiries are good tools to analyse barriers to implementation: knowledge, attitude
- But not to measure the quality of practice
- An in-depth audit is needed

Audit: what it is not (2)

- Point prevalence measurements (PPS)
- Monitoring by (process) Quality Indicators

European Surveillance of Antimicrobial Consumption (ESAC): quality indicators for outpatient antibiotic use in Europe

Samuel Coenen, Matus Ferech, Flora M Haaijer-Ruskamp, Chris C Butler, Robert H Vander Stichele, Theo J M Verheij, Dominique L Monnet, Paul Little, Herman Goossens, the ESAC Project Group

Qual Saf Health Care 2007;16:440-445. doi: 10.1136/qshc.2006.021121

Development of quality indicators based on consumption data on aggregate country level

27 experts scored the relevance of a set of 22 proposed **quantitative indicators** to

- Reducing antimicrobial resistance
- Patient health benefit
- Cost effectiveness
- Public health policy makers

Contextual!



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TOPICS

Topics for Audit & Feedback

- Barlow *et al.* 2007: “door to antibiotic time” in **CAP**
- Marwick *et al.* 2013: antibiotic administration within 4 h of **sepsis** onset
- - Bratzler *et al.* 2007 **Surgical prophylaxis (SCIP)**
 - Van Kasteren *et al.* 2005 – Netherlands multicenter study
-



AUDIT & FEEDBACK

HOW?

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What is Optimal Prescribing of Antibiotics ?

Qualitatively

- Maximally effective
- Minimally toxic
- Cost containment
- Minimal development of resistance (selective)

Three major types of antimicrobial therapy

- Empiric therapy
= “well informed guess”
- Definitive therapy
directed at the causative organism
when it is (partially) known
- Prophylaxis

Major Determinants of the Quality of Prescribing of Antimicrobial drugs

Selection of an Empirical therapy

- local surveillance data on antimicrobial resistance
- availability of point of care tests
- guidelines for (severe) clinical syndromes
- availability of the drugs and prompt administration

Streamlining or De-escalation to Definitive therapy

good and rapid communication with the microbiology laboratory during the entire diagnostic process from request of the test to interpretation and application of the results

Types of audits

- "Simple" audits, point prevalence
- Intervention audits
 - "before and after" without a control group by time series analysis
 - "before and after" with a control group
 - randomized controlled trials

Ramsey et al Room for improvement: a systematic review of the quality of evaluations of interventions to improve hospital antibiotic prescribing.
J Antimicrob Chemother 2003;52:764-771



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THE PROFILE OF THE PRESCRIBER

Many authors do not describe the profile of the prescribers

- Senior or junior prescribers?
- Responsibilities?
- Type of supervision of residents?
- Authority of seniors?
- Different jargon: « consultants » in the UK ,
« attendants » in the US ...



Guidelines

Superman

Between Vice and Virtue. Hercules. Flemish painting, Musée du Louvre, Paris
ICG 2014

Barriers to audit

- Non acceptance of the principle
- “Therapeutic freedom of the prescriber”
- Non acceptance of external interference
- Fear of:
 - political consequences
 - legal consequences
- Financial and logistic barriers

START WITH AN INVENTORY OF BARRIERS



AUDIT (& FEEDBACK)

QUALITY MEASURES

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Measuring quality: the Outcomes

3 types of outcomes:

– Patient outcome measures

- Clinical

- Economical (Cost, Quality of Life)

– Microbiological outcome measures

– Process outcome measures

Patient outcome measures used in intervention studies

Mortality rate (related to infection) at 30 days

Length of stay

- **related to infection**
- **in intensive care**

Readmission or admission (outpatients)

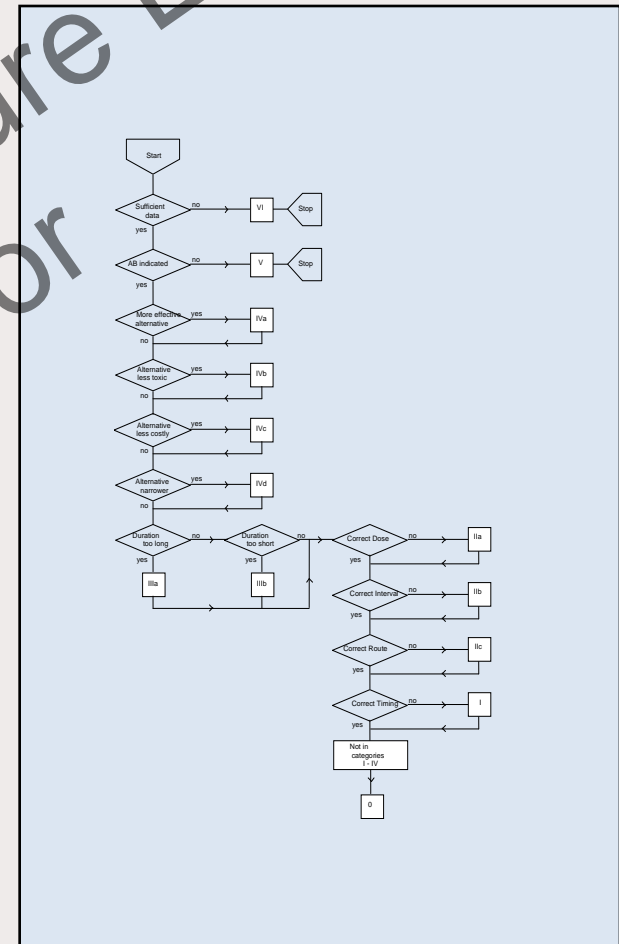
Rate of nosocomial infections: SSI

« Cure » (or absence of relapse)

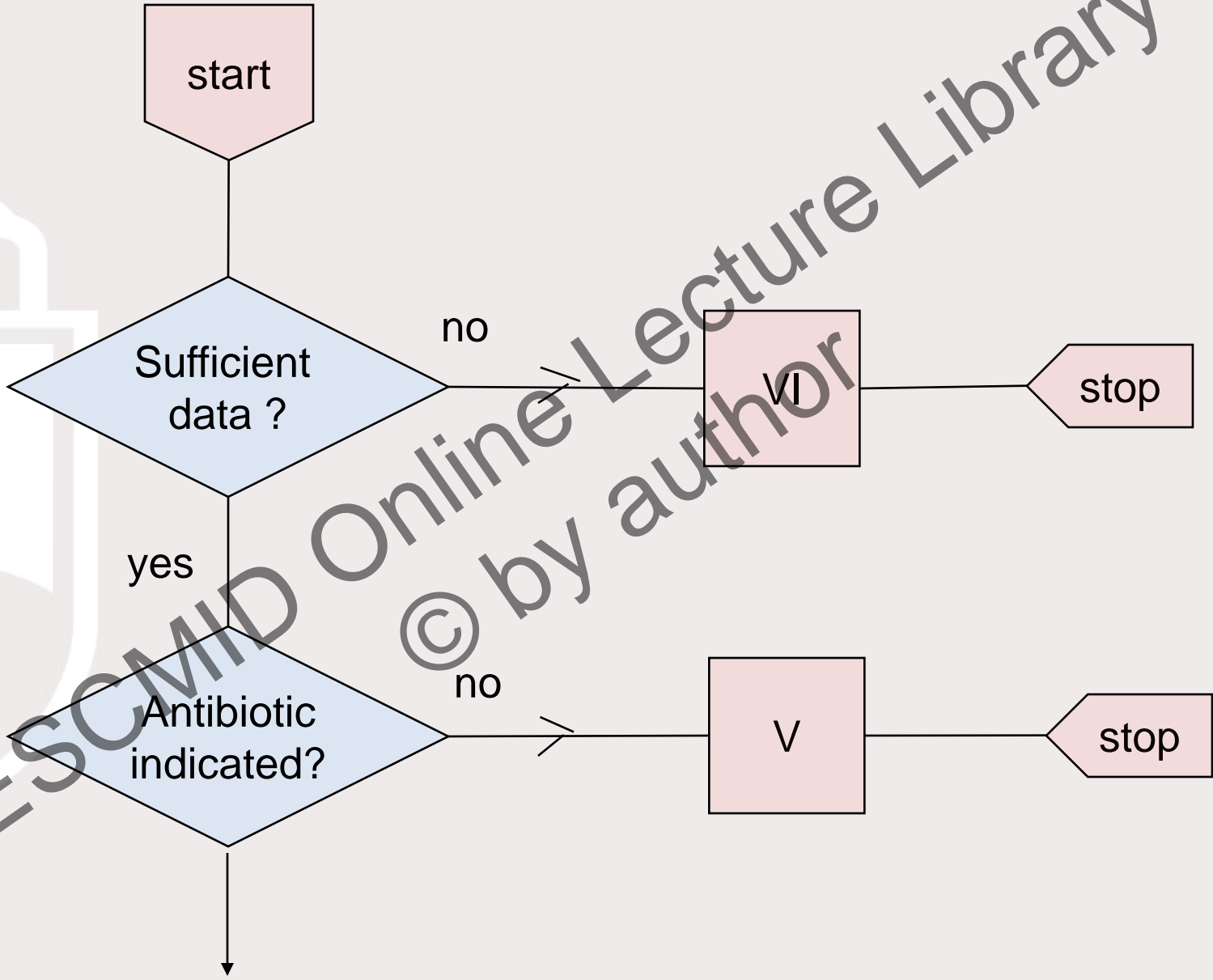
Side effects (allergies, toxicity)

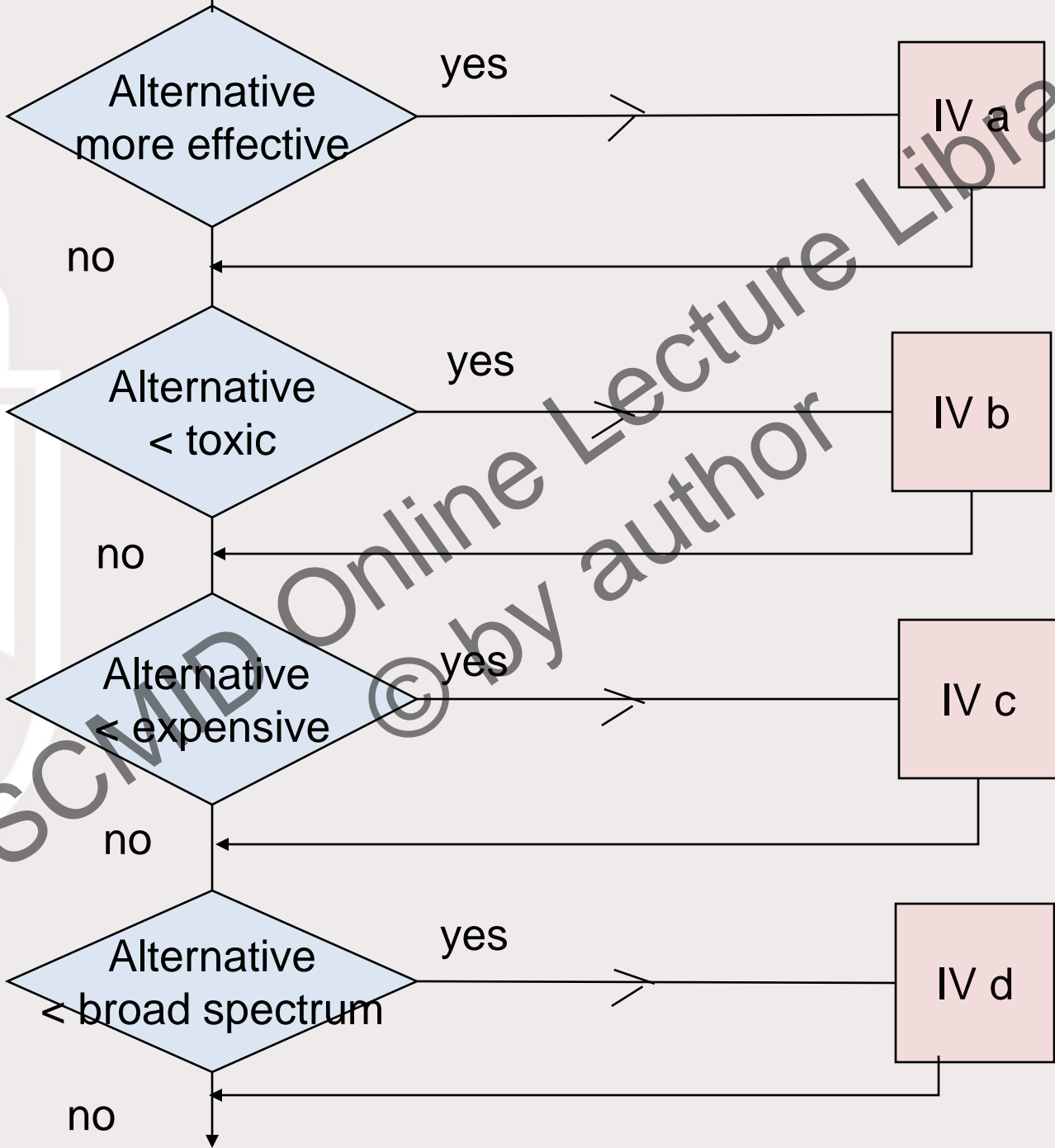
Criteria for review of individual Antibiotic Prescriptions

- Indication
- Choice of antibiotic
 - antimicrobial activity
 - toxicity
 - width of spectrum
 - cost
- The antibiotic regimen
 - The dose
 - The interval
 - The way of administration
- The duration
- The timing

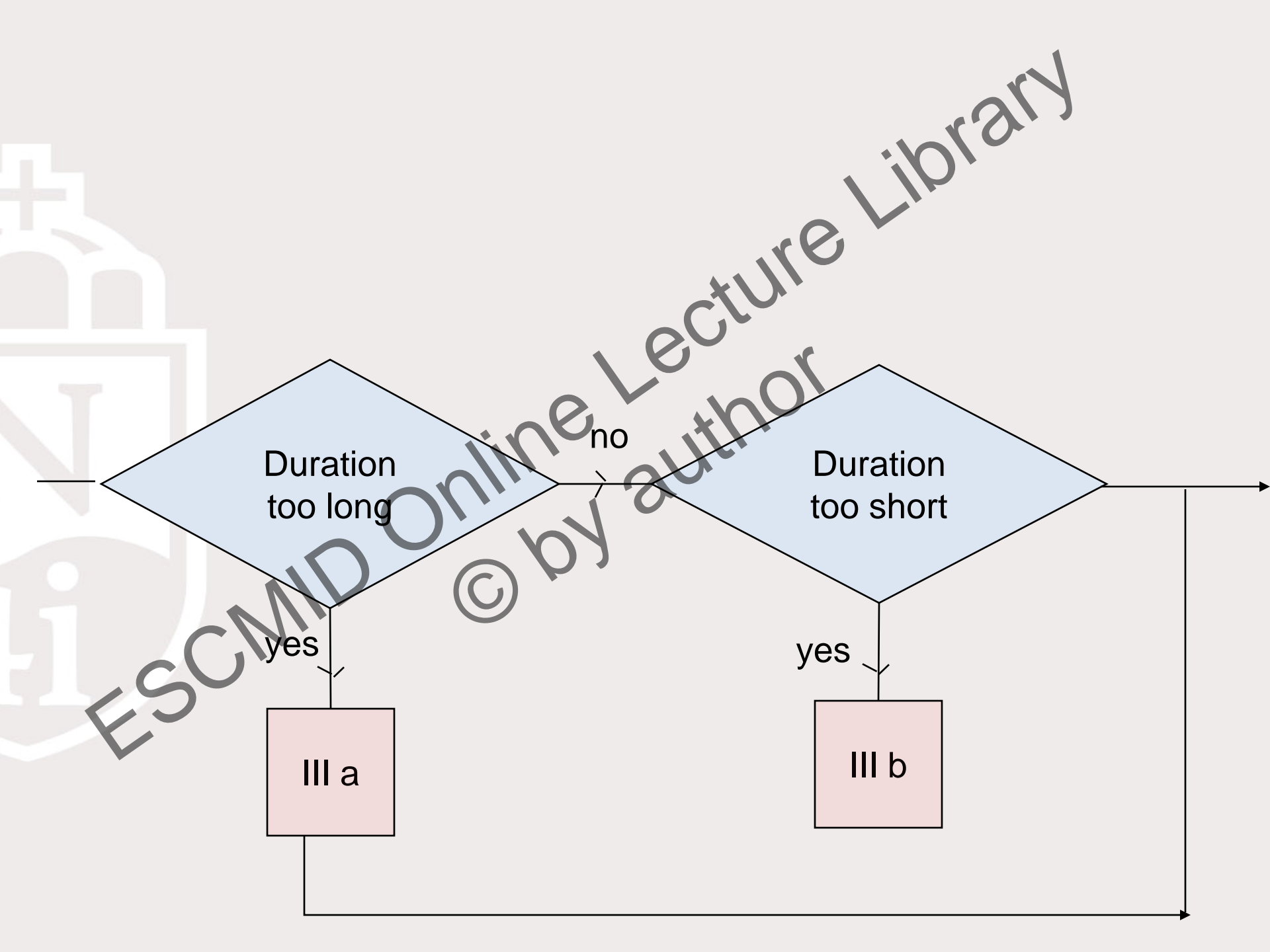


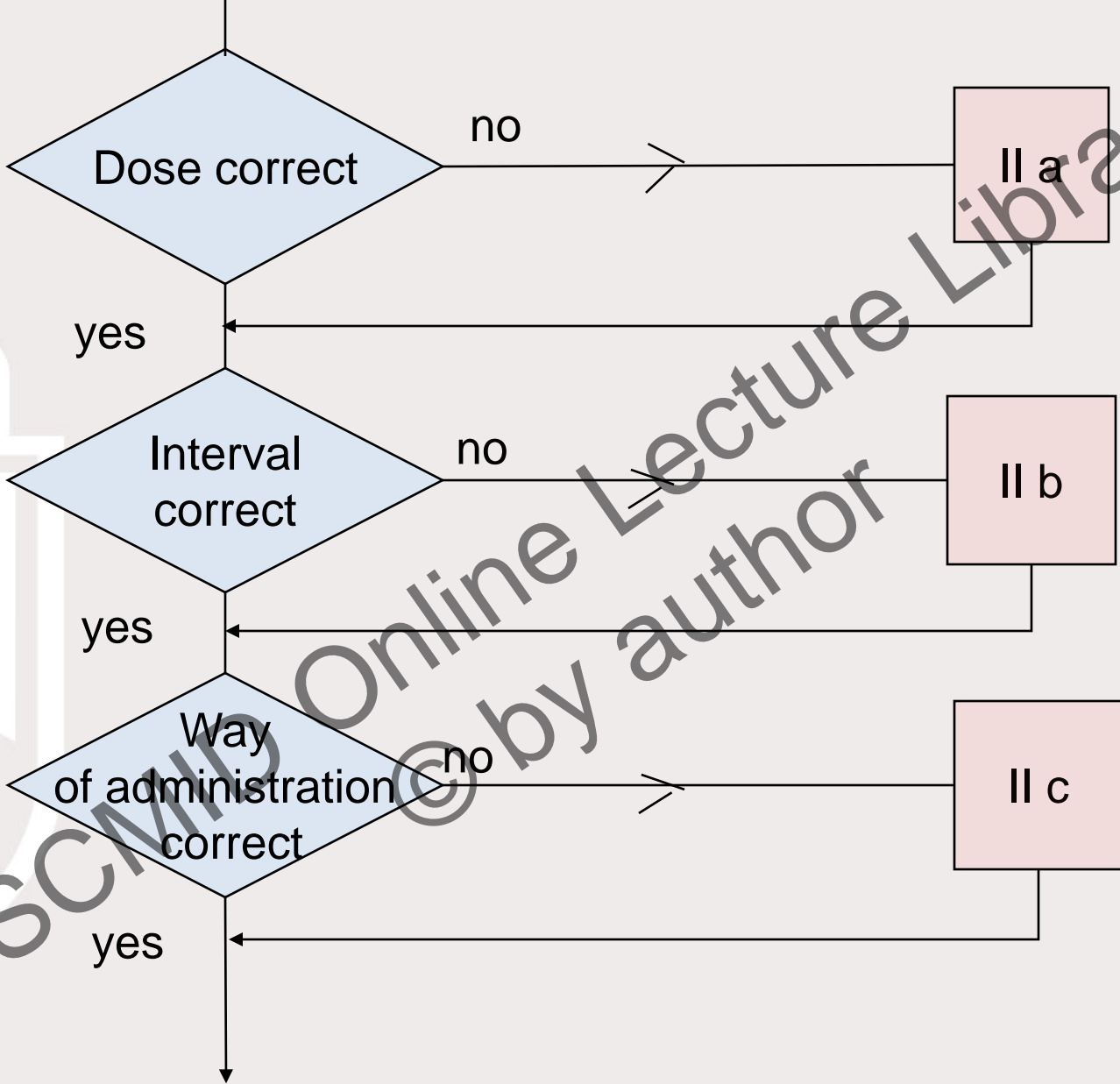
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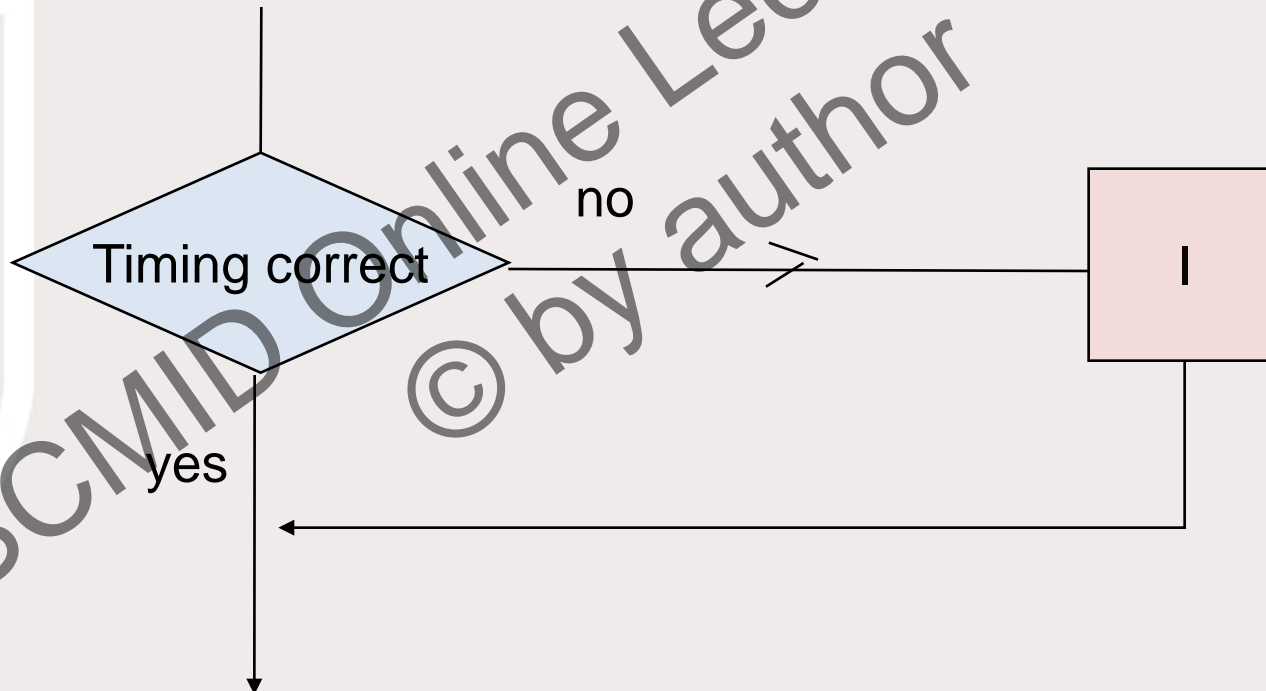


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Timing



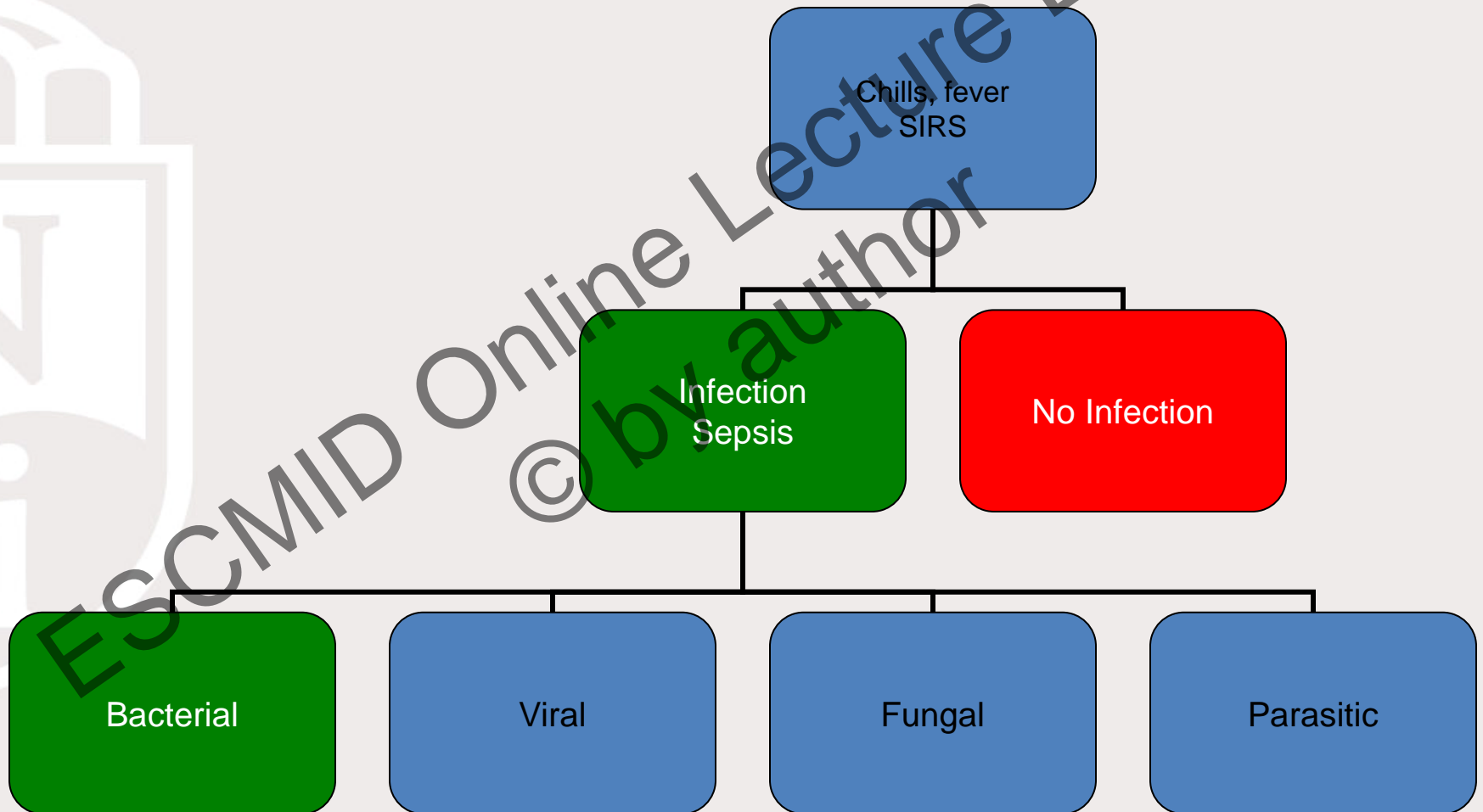
Illustrative Case

- A 60-year old patient is admitted from home. He has experienced severe chills for two days and complains of generalised myalgia. He is not known as being immunocompromised or allergic. He is treated for hypertension.

His temperature is 39.0°C, blood pressure 100/60 mm Hg, pulse 96/min. Leucocytes $9 \times 10^9/l$, Platelets $140 \times 10^9/l$, creatinine 1.25 g/dl. CRP is 250 mg/dl.

- Working diagnosis: **severe sepsis without an apparent site of infection.**

Differential diagnosis



Case (ct'nd)

The hospital local guideline, adapted from a national guideline, recommends ceftriaxone 2 g with gentamicin 7 mg/kg iv



STICHTING WERKGROEP ANTIBIOTICABELEID

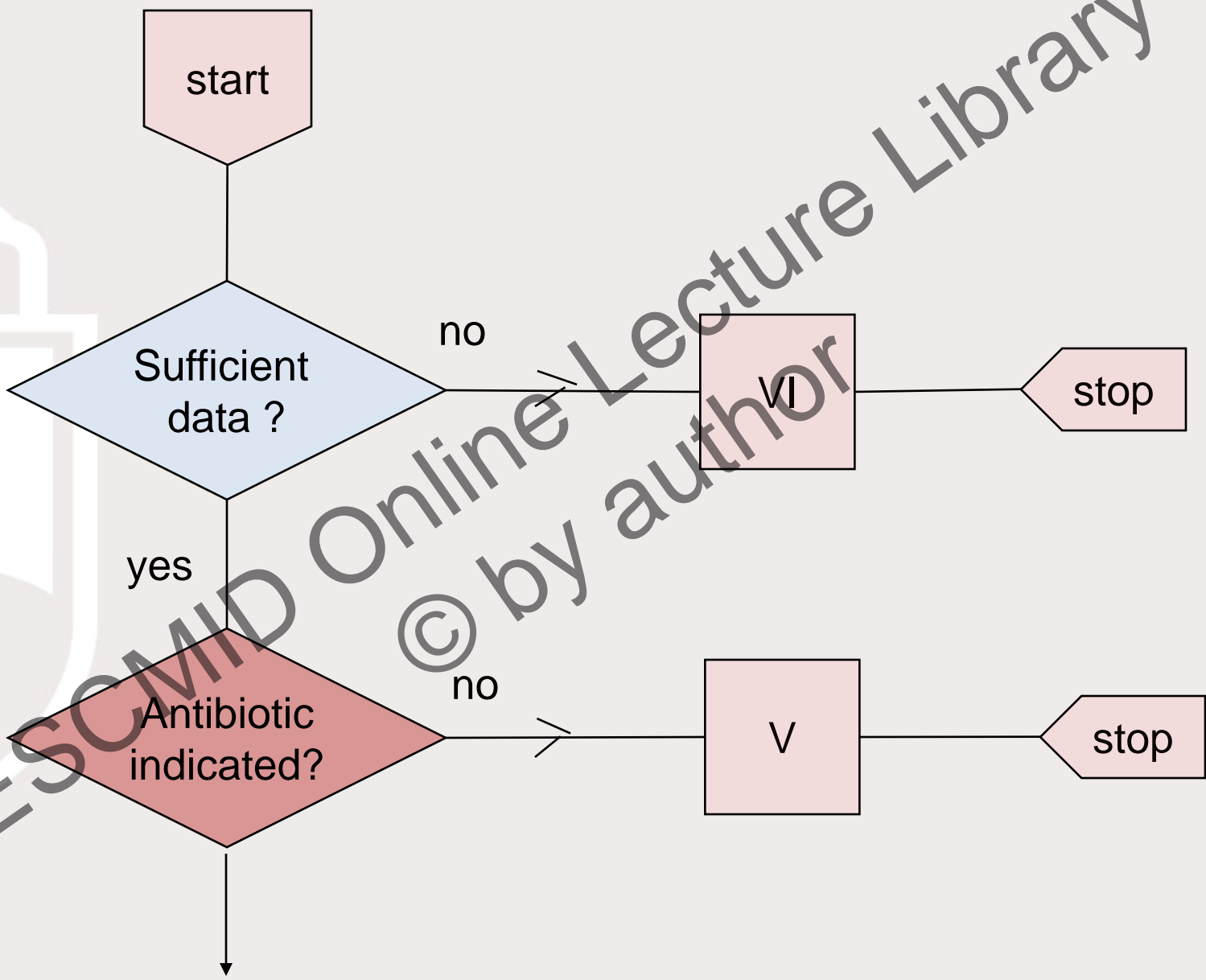
SWAB guidelines for

Antibacterial therapy of adult patients with Sepsis

www.swab.nl/guidelines

Sepsis is considered present if an infection is suspected or proven and two or more of the following criteria are met: tachycardia ($>90/\text{min}$), tachypnea ($>20/\text{min}$), fever ($>38.3^{\circ}\text{C}$) or temperature $<35.6^{\circ}\text{C}$, leucocytosis ($>12 \times 10^9/\text{l}$) or leucopenia ($<4 \times 10^9/\text{l}$), $>10\%$ immature (band) forms. Severe sepsis is defined as sepsis associated with organ dysfunction, hypoperfusion, or hypotension. Septic shock is diagnosed when hypotension persists despite adequate fluid resuscitation or when perfusion abnormalities occur. This guideline focuses on bacterial and fungal infections associated with sepsis.

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Case Case (ct'nd

- A 60-year old patient is admitted from home with **severe sepsis without an apparent site of infection.**
- On day 1 4/4 blood culture bottles grow gram positive cocci in clusters. The patient is stable but the temperature is 38,2°C
-?
- On day 2 the microbiologist reports that *S. aureus* is isolated from all 4 bottles. There is clinical improvement, the temperature is 37,9°C. CRP is 130.
- Imaging is compatible with spondylodiscitis Th5-7
-?

Case Case (ct'nd

- Day 3: revise therapy!
- *S. aureus* is susceptible to flucloxacillin (MSSA)
- Streamline!
 - Stop ceftriaxone and give flucloxacillin

Other illustrative cases of streamlining/de-escalation:

Gyssens IC, P.J. van den Broek, B.J. Kullberg, Y.A. Hekster & J.W.M. van der Meer. Optimizing antimicrobial therapy. A method for antimicrobial drug use evaluation. *J Antimicrob Chemother* 1992;30:724-727.

Gyssens IC, WV Kern, DM Livermore.

The role of antibiotic stewardship in limiting antibacterial resistance among hematology patients. *Haematologica* 2013;98:1821-5.



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AUDIT (& FEEDBACK)

BY WHOM?

Audit by experts

**Handling authoritative criteria,
based on evidence**

Quality Evaluation: a multidisciplinary task

Infectious diseases physicians	Kunin 1973, Volger et al. 1988, Gyssens et al. 1996, Gyssens et al. 1997, Maki 1978; Fluckiger et al. 2000, van Kasteren et al 2003
Infectious diseases physicians and pharmacists	Natsch et al. 2001, Dunagan et al. 1991
«Clinical pharmacologist »	Achong et al. 1977
« Senior physicians » with expertise in infectious diseases	Thuong et al. 2000
2 infectious diseases physicians + surgeon	Parret et al. 1993
Infectious diseases physicians + microbiologists	Byl et al. 1999
2 microbiologists	Swindell et al. 1983

Quality assessment of antimicrobial drug prescriptions (N= 1153) by three reviewers, Indonesia AMRIN Study

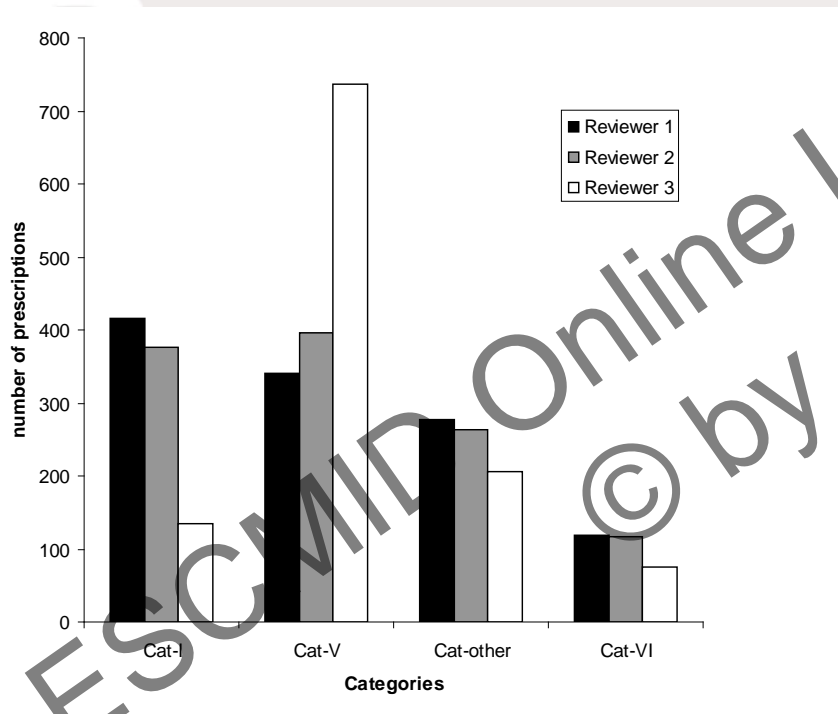
Reviewer 1 was a senior physician from the relevant department, reviewer 2 from another department, and reviewer 3 was an infectious diseases expert from The Netherlands.

Cat-I: category I, definitely appropriate

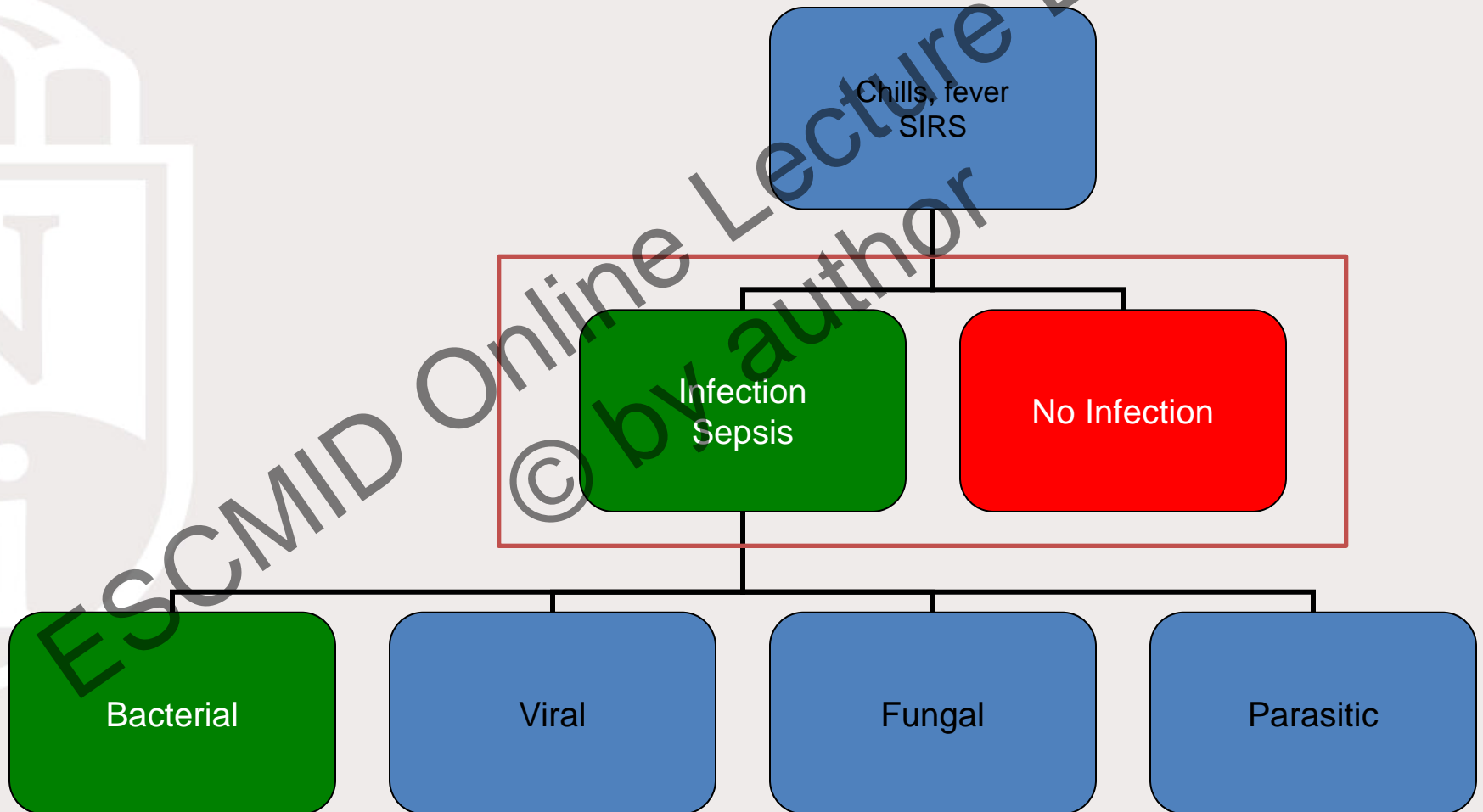
Cat-V: category V: unjustified, no indication

Cat-other: inappropriate due to several reasons

Cat-VI: unevaluable due to insufficient information



Differential diagnosis



To simplify, audit against a “standard”
do not rely on expert judgement only

- International guidelines
- National guidelines



Dutch Working Party on Antibiotic Policy
www.swab.nl

- Local guidelines (= true adherence)

Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

Timothy H. Dellit,¹ Robert C. Owens,² John E. McGowan, Jr.,³ Dale N. Gerding,⁴ Robert A. Weinstein,⁵ John P. Burke,⁶ W. Charles Huskins,⁷ David L. Paterson,⁸ Neil O. Fishman,⁹ Christopher F. Carpenter,¹⁰ P. J. Brennan,⁹ Marianne Billeter,¹¹ and Thomas M. Hooton¹²

A. *Prospective audit with intervention and feedback.*

Prospective audit of antimicrobial use with direct interaction and feedback to the prescriber, performed by either an infectious diseases physician or a clinical pharmacist with infectious diseases training, can result in reduced inappropriate use of antimicrobials (A-I).

Should we measure quality by PPS, audit, or quality indicators?

	PPS	Audit	Quality indicator
evaluation	limited	thorough	specific
scale	large	small	Very large
frequency	2x/year	when needed	continuous
level	hospital	ward	national
workload	short, intensive	large	low
how to use?	repeat regularly	on indication	suitable for monitoring

AUDIT Recommendations

- An audit with a standardised method should allow comparisons between wards, hospitals and countries
- Audits should be followed by interventions
- In addition to process outcome measures, data on patient outcome and microbiological outcome are needed