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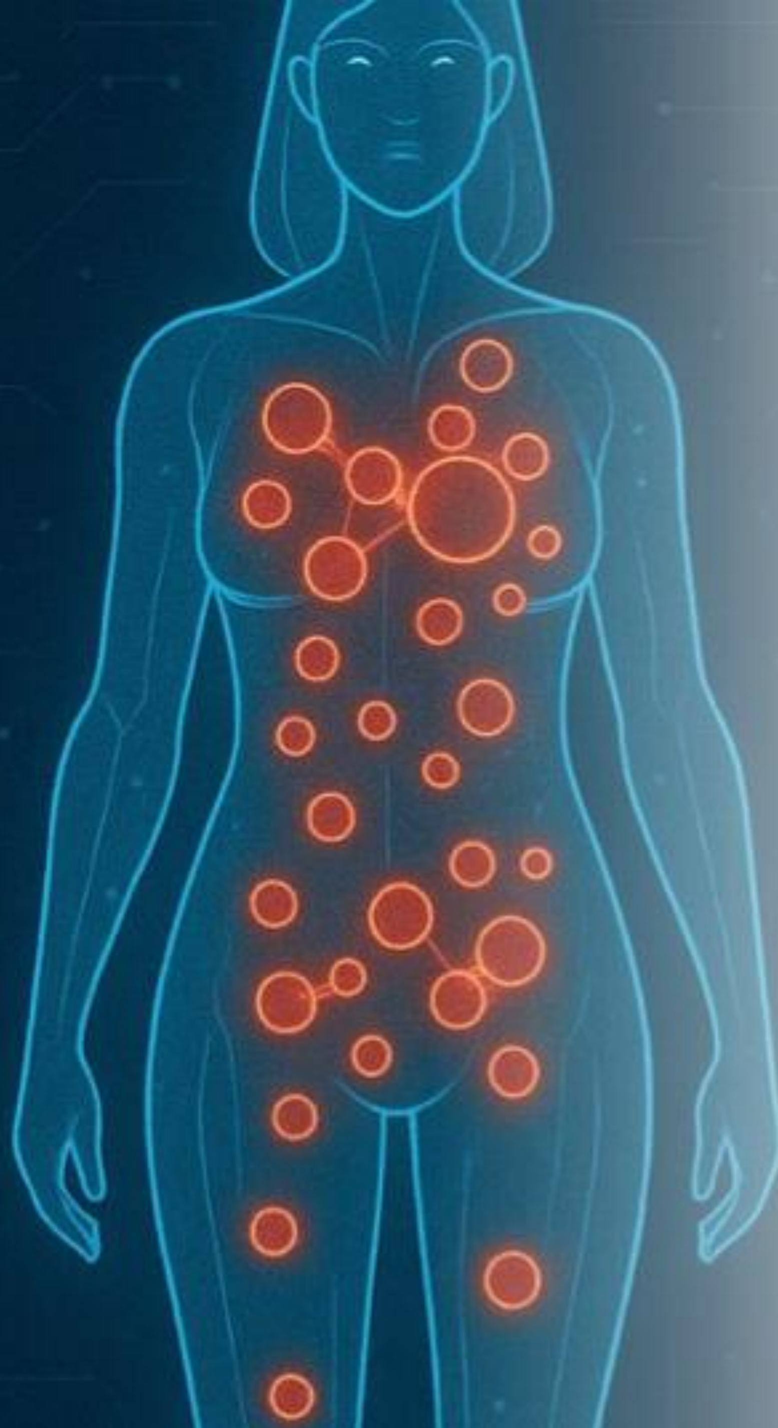
WFICC
WORLD FEDERATION OF INTENSIVE AND CRITICAL CARE

PCT Informing Antimicrobial Stewardship

Fathima Paruk, PhD, Head of Dept: Critical Care and Emergency Medicine ,University of Pretoria

Sepsis

(Severe Infection resulting in organ dysfunction)



47 million cases a year

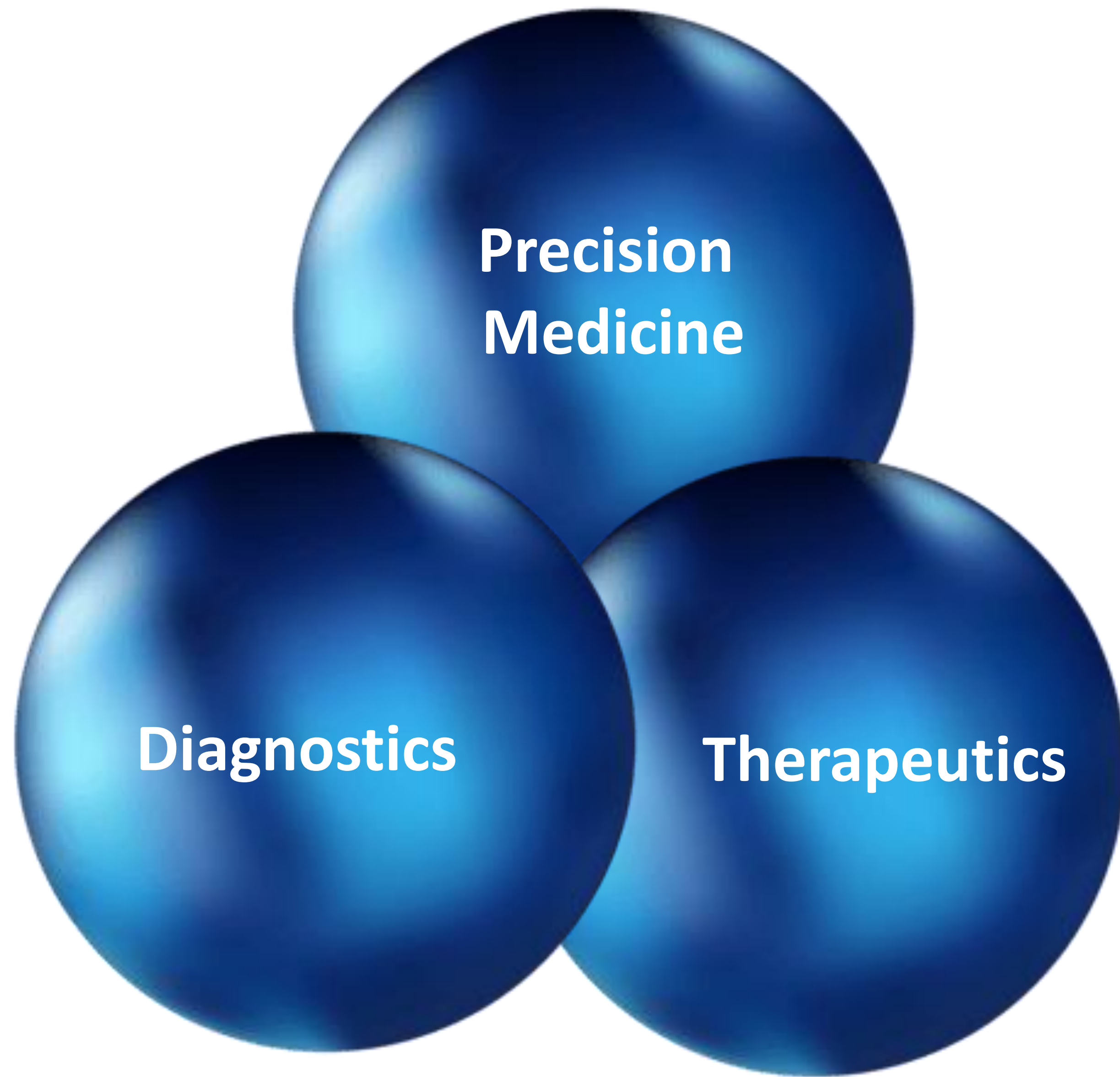
Mortality: 20-40%

11 million deaths globally

90% of deaths in developing countries

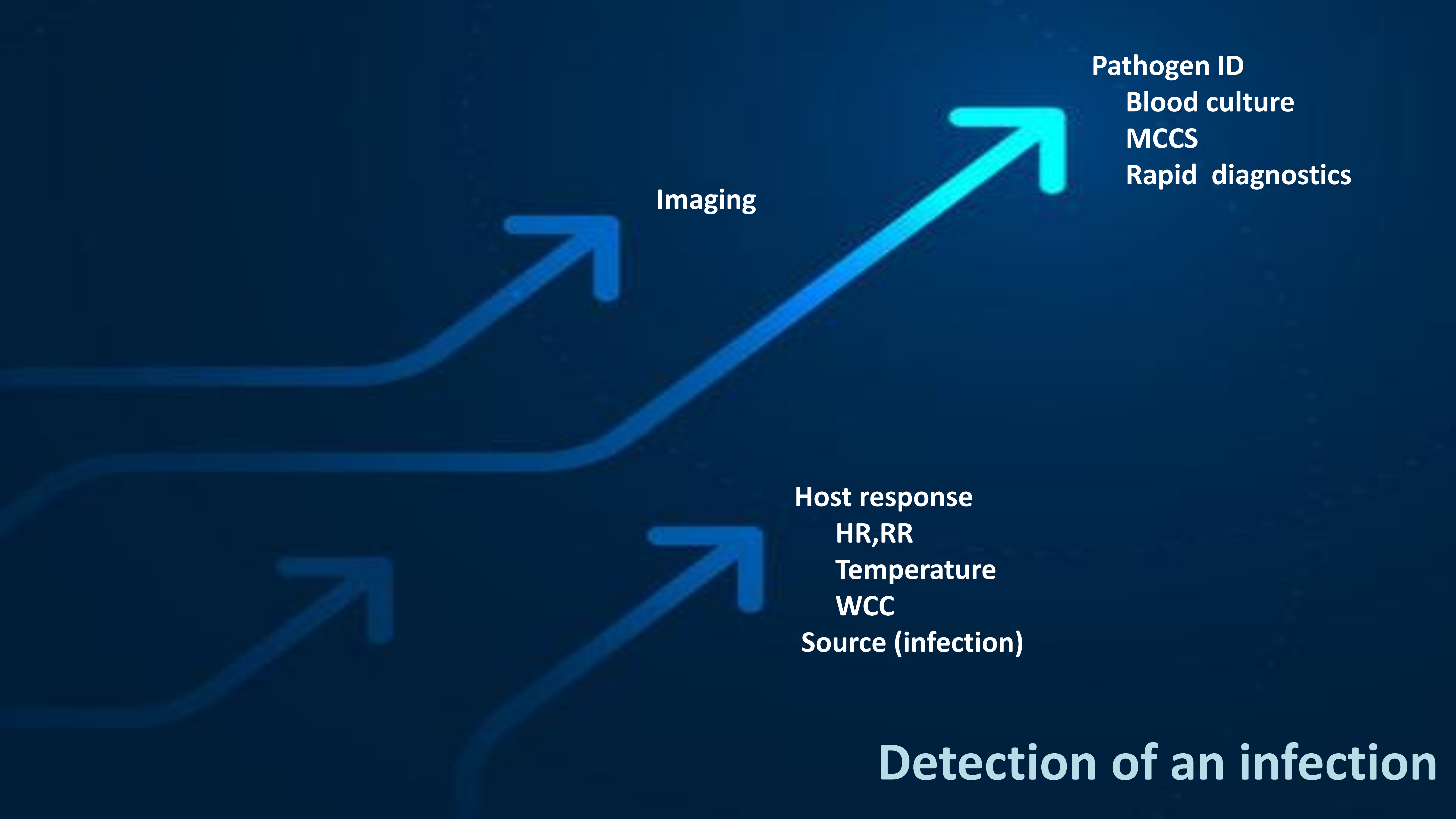
Antimicrobial resistance
Diagnostic uncertainty
Antimicrobial overuse

Rudd KE, et al Lancet. 2020
WHO,2020



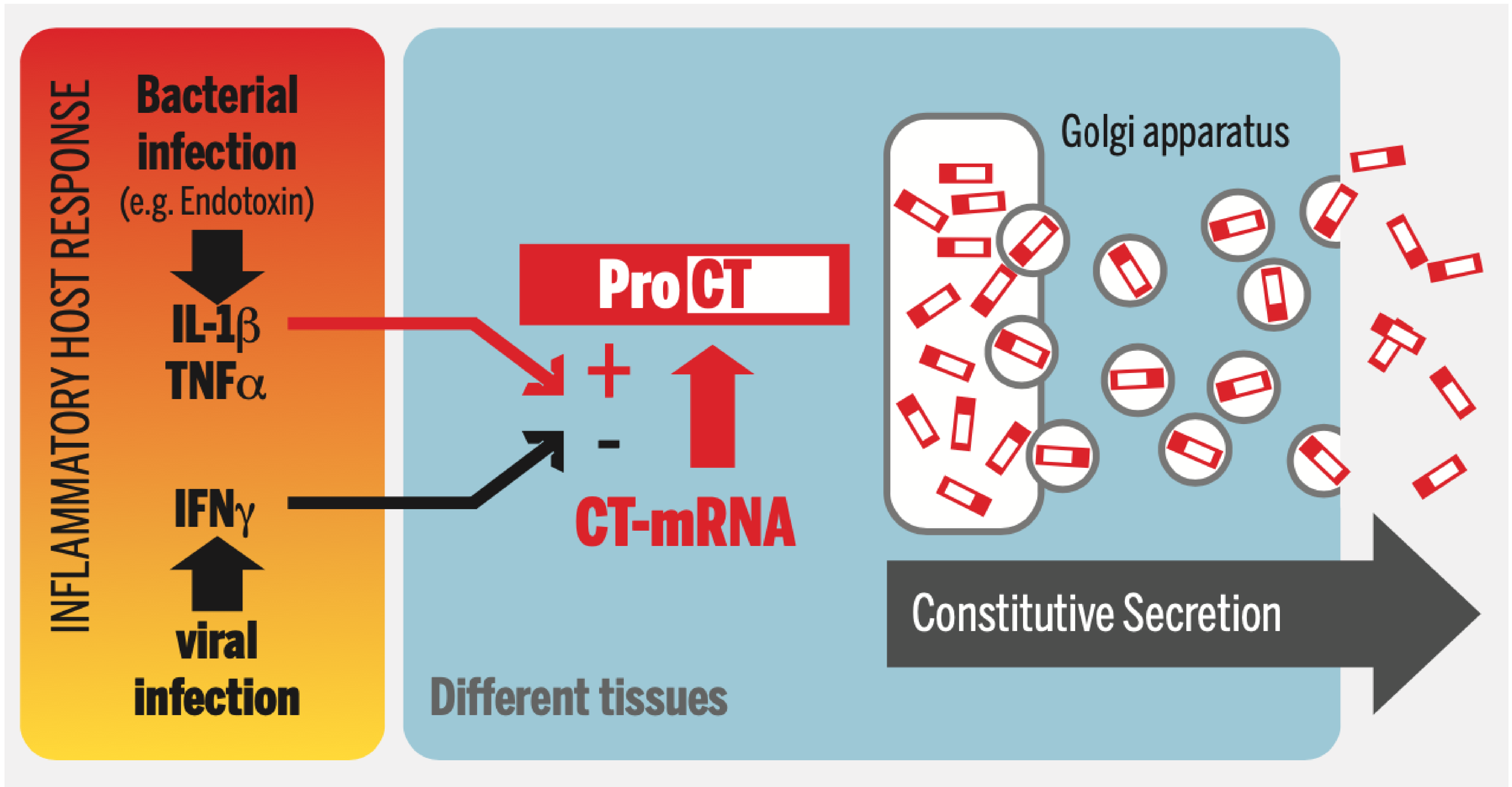
Diagnostics

- Right time (Initiate)
- Right duration (discontinue)
- Monitor (response)


Pathogen ID
Blood culture
MCCS
Rapid diagnostics
Imaging
Host response
HR,RR
Temperature
WCC
Source (infection)
Detection of an infection

C reactive protein (CRP)
Procalcitonin (PCT)

Detection of an infection



Adapted from Christ-Crain M *et al.* Swiss Medical Weekly 2005;135(31-32):451-460 [7].
Pro-CT: Prohormone of calcitonin. CT-mRNA: Calcitonin-messenger ribonucleic acid

Special Communication | CARING FOR THE CRITICALLY ILL PATIENT

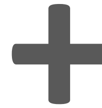
The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Mervyn Singer, MD, FRCP; Clifford S. Deutschman, MD, MS; Christopher Warren Seymour, MD, MSc; Manu Shankar-Hari, MSc, MD, FFICM;

JAMA. 2016;315(8):801-810. doi:10.1001/jama.2016.0287

Sepsis

INFECTION



SOFA Score
↑ by ≥ 2 points

Sepsis - Septic shock
Mortality 20 - 40%

Sequential [Sepsis-Related] Organ Failure Assessment Score

System	Score 0	1	2	3	4
RESPIRATION					
PaO_2/FIO_2, mm Hg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
COAGULATION					
Platelets, $\times 10^3/\mu L$	≥150	<150	<100	<50	<20
LIVER					
Bilirubin, mg/dL (μmol/L)	<1.2 (20)	1.2–1.9 (20–32)	2.0–5.9 (33–101)	6.0–11.9 (102–204)	>12.0 (204)
Cardiovascular	MAP ≥70 mm Hg	MAP <70 mm Hg	Dopamine <5 or dobutamine (any dose)[a]	Dopamine 5.1–15 or epinephrine ≤0.1 or norepinephrine ≤0.1[a]	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1[a]
CENTRAL NERVOUS SYSTEM					
Glasgow Coma Scale score[b]	15	13–14	10–12	6–9	<6
RENAL					
Creatinine, mg/dL (μmol/L)	<1.2 (110)	1.2–1.9 (110–170)	2.0–3.4 (171–299)	3.5–4.9 (300–440)	>5.0 (440)
Urine output, mL/d				<500	<200

Septic Shock

INFECTION

SOFA Score
↑ by ≥ 2 points

with

- Hypotension requiring vasopressors to keep MAP > 65mmHg
- Lactate >2mmoL/L with adequate volume resuscitation

Biomarker response to an infection

CRP
Rises 24+ hrs
Peaks at 48 hrs

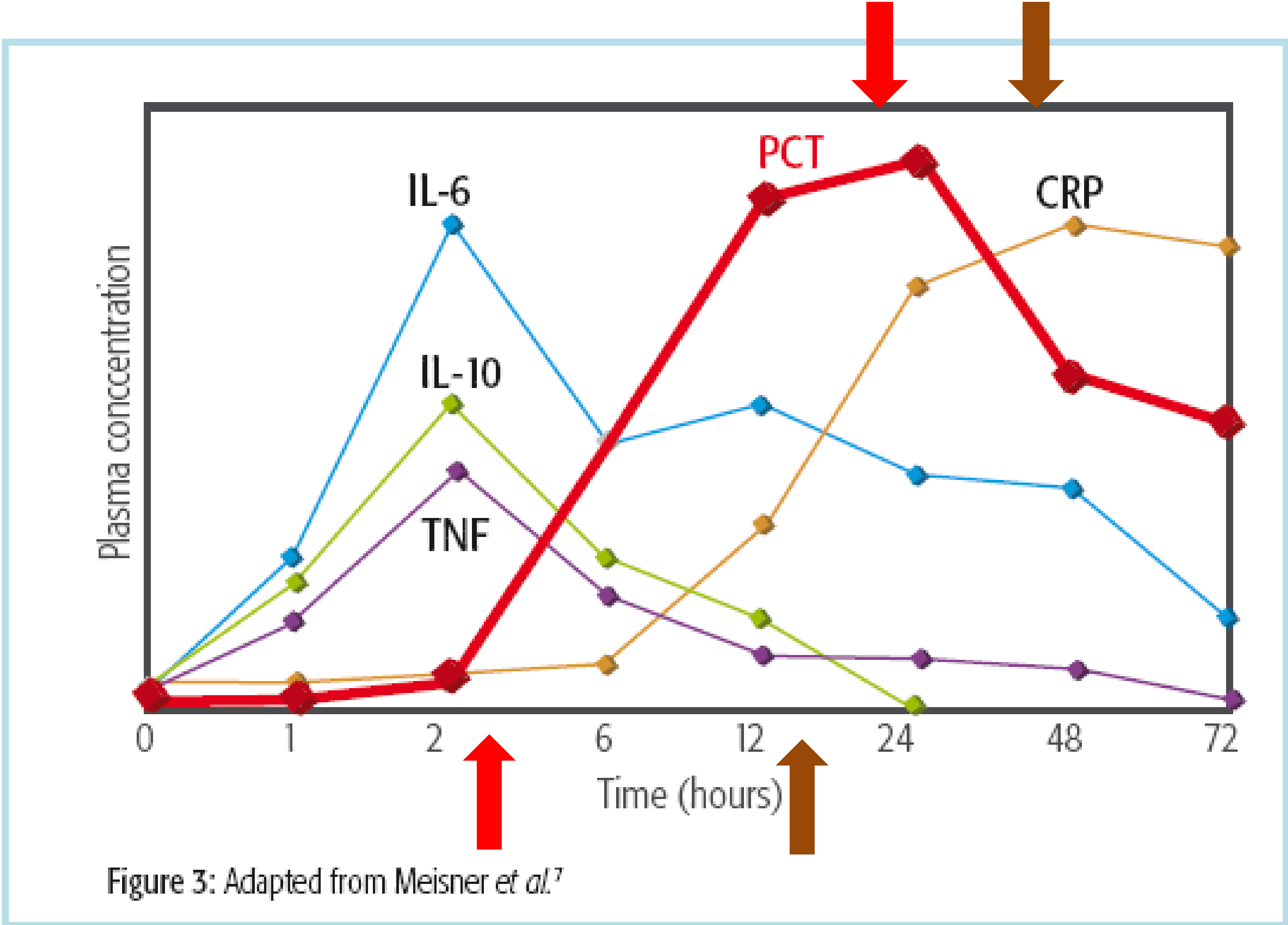
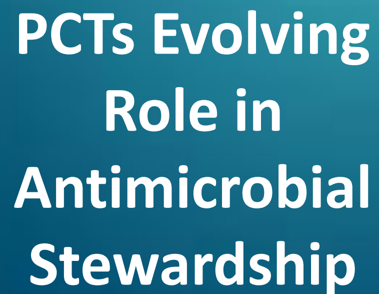


Figure 3: Adapted from Meisner *et al.*[7]

PCT
T ½ 24 hrs
Rises 6-12 hrs
Peaks at 24 hrs

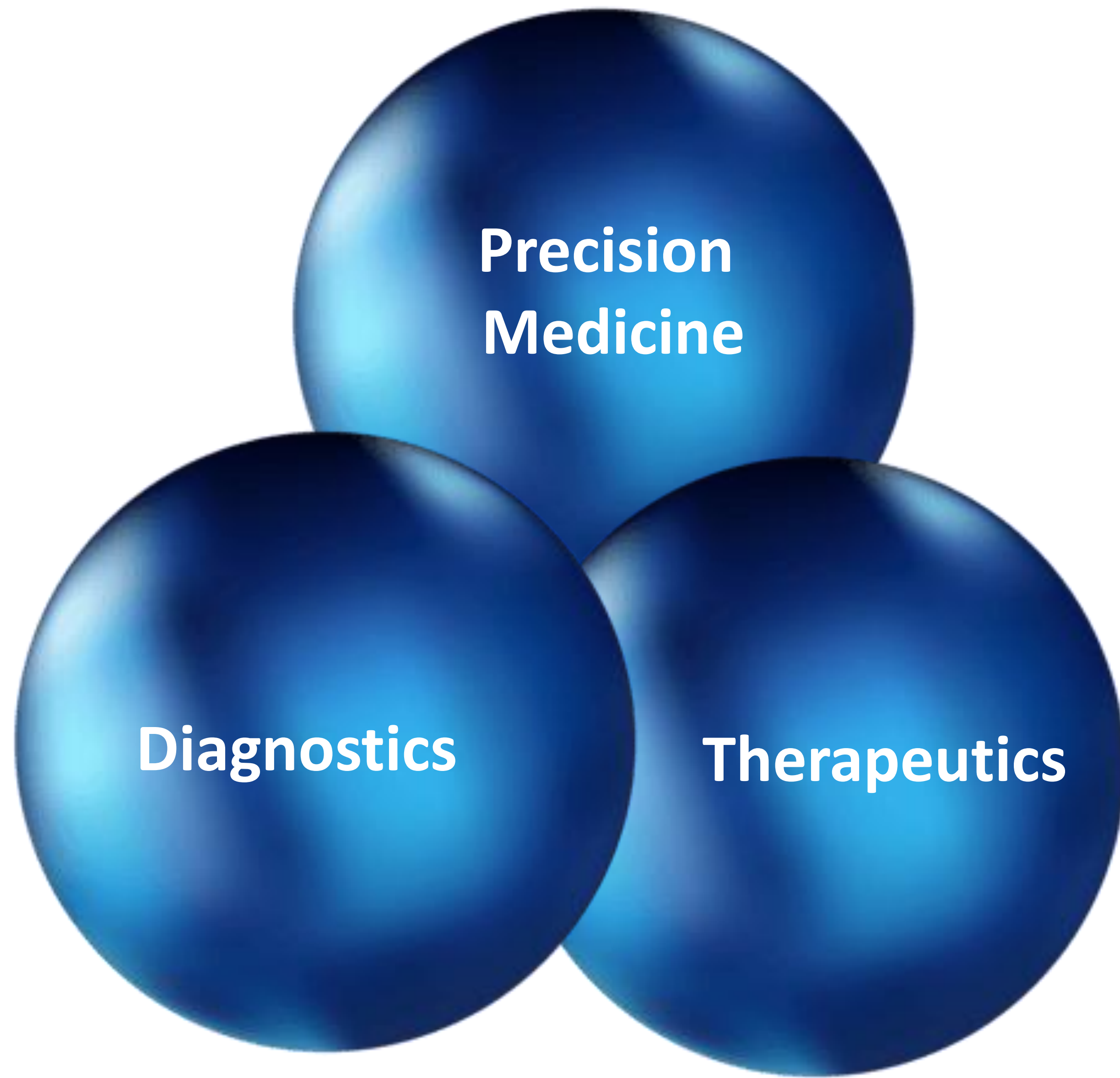
Meisner,2000
Vijayan et al, J Int Care,2017



PCT trends/kinetics vs absolute/cut-offs
Personalised use
Antibiotic Duration
Diagnosis

Expanded role beyond bacterial infections

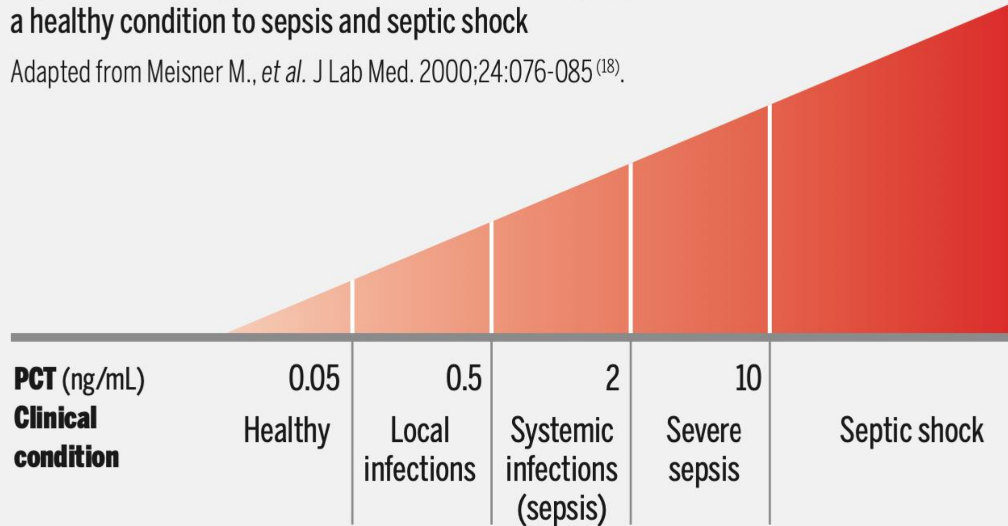
- COVID-19 and influenza(⇩ unnecessary antibiotics)
- Surgical population (complications, infections)
- Candida infection likelihood
- PCT+digital tools(AI)/multimodal diagnostics
- LMICs (cost effective care)



Clinical Context
+
Procalcitonin

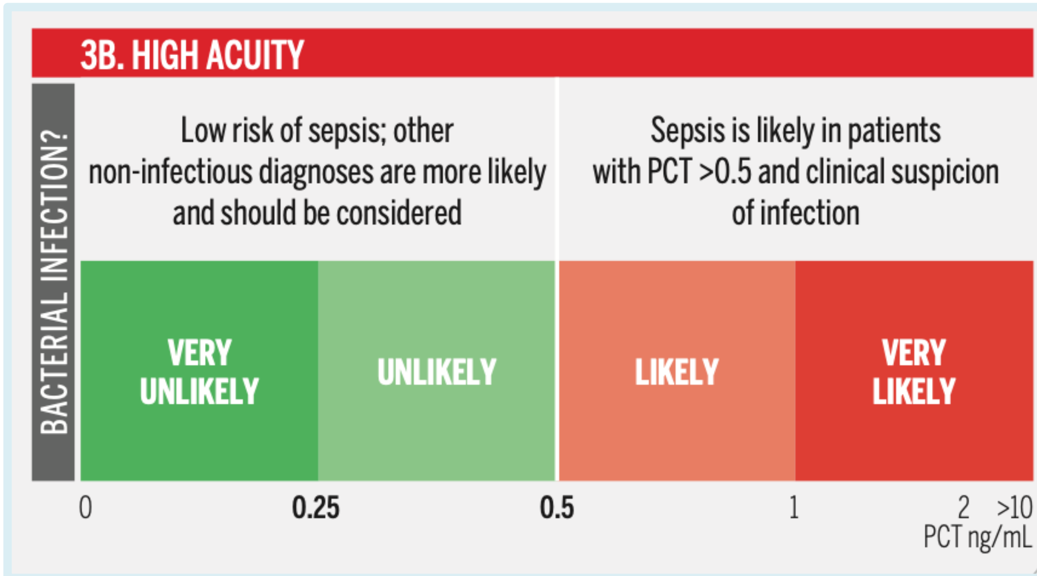
Diagnostics

- Right time
- Right duration
- Real time monitoring



<0.25 µg/L – low probability of bacterial infection

>0.5 µg/L – bacterial infection likely

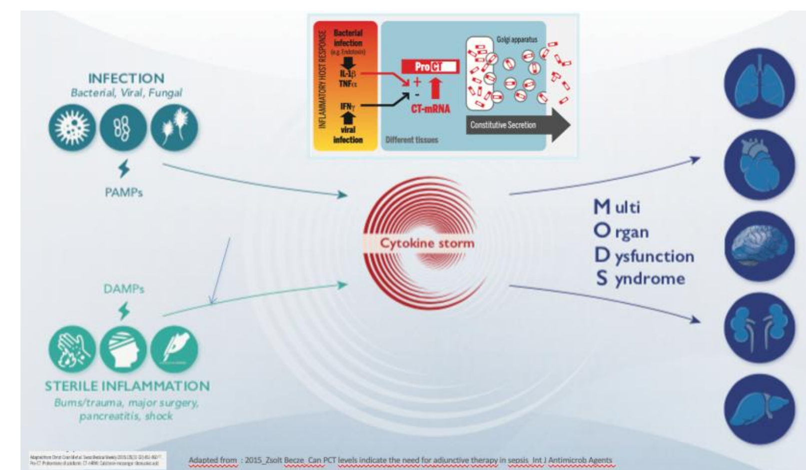


Adapted from Meisner M., *et al.* J Lab Med. 2000;24:076-085 [18].

Clinically

Is there a Significant range?

Adapted from Schuetz P *et al.* BMC Medicine 2011;9:107 [4] and Albrich WC et al. Arch Intern Med. 2012;172(9):715-722 [69]



Extensive Burns

Massive transfusion

Trauma

Sepsis

Cardio Pulmonary Bypass

Pancreatitis

Rhabdomyolysis

Inflammatory Response

Cardiac failure

Bone et al. Chest 1992

⇧ PCT	Bacterial Infection Inflammatory response (Trauma, Burns, Surgery)
⇩ PCT	Resolution of bacterial infection (source control) Resolution of Inflammatory Response (trauma, surgery, burns)
Magnitude of PCT response	Reflects the magnitude of cytokines (infection or IR)
Viral and Fungal infections	PCT will ⇩ (γ IFN suppresses IL6 and IL-1 production) [sick patient with normal or ⇩ PCT]
80% ⇩ PCT and a well patient	Stop antibiotics

Patient AB

45 years old
Obese
Diabetic

Day 4 Hospital admission
For elective repair large incisional hernia (delay)

Respiratory distress
Supplemental O2
Confusion
MAP 60 mmHg

PE

Cardiac

Sepsis

Patient AX

45 years old
Obese
Diabetic

Day 4 Hospital admission
For elective repair large incisional hernia (delay)

Pyrexial
Resp distress
Pneumonia most likely

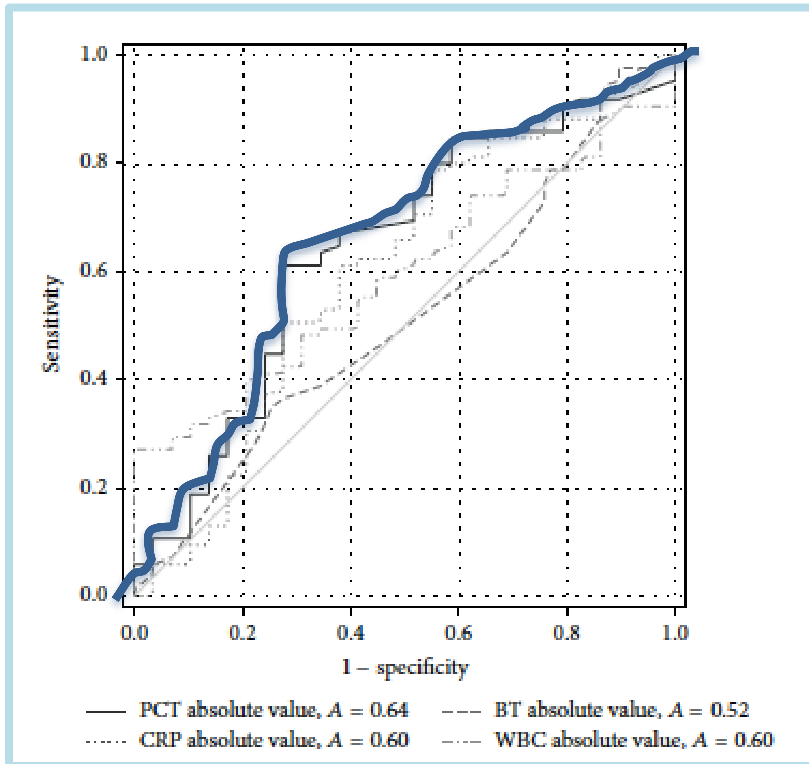
ICU admission
MV
Ertapenem and Pip-Tazobactam

	Previous Day	Today
TEMP	37.2^{0}C	39^{0}C
HR	85	95-110
MAP	80	60
FiO2	RA	0.60
WCC	12	19
PLATELETS	155	150
BGL	7-9mmol/L	
CRP	45	150
PCT ng/mL	1.8	3.2
URINE	>1mL/Kg/Hour	
SCVO2		71
AVCO2		5
Fluid balance		1050

Delta Procalcitonin Is a Better Indicator of Infection Than Absolute Procalcitonin Values in Critically Ill Patients: A Prospective Observational Study

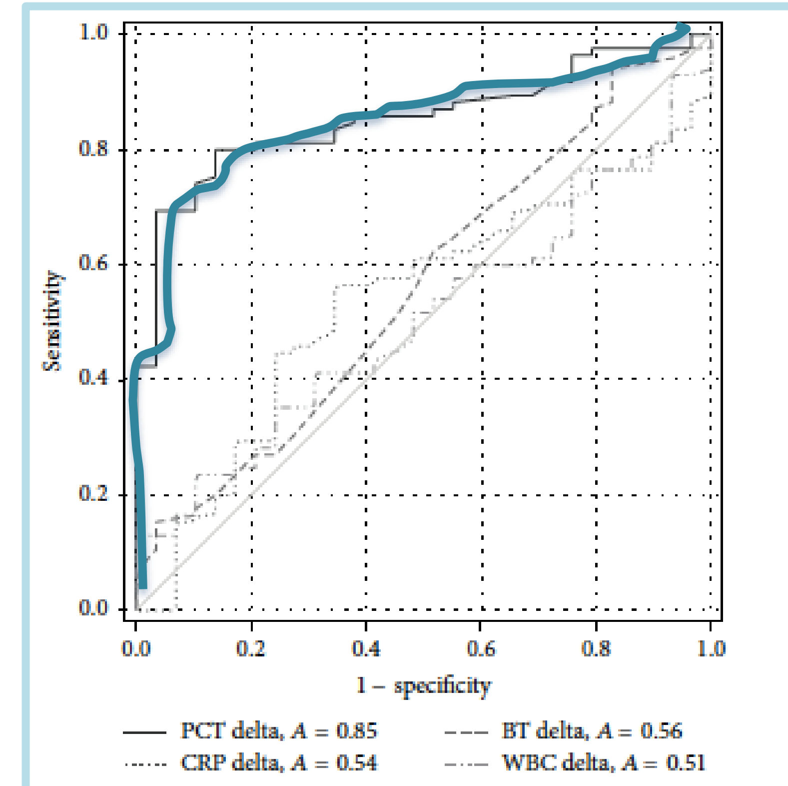
Domonkos Trásy,[1] Krisztián Tánczos,[1] Márton Németh,[1]

Journal of Immunology Research
Volume 2016, Article ID 3530752, 9 pages



Absolute PCT

Eprok



88% Change in PCT in 24 hours

Previous studies PCT: Usually Better Sensitivity and Specificity than with IL-6 or CRP

Harbarth S. Am J Respir Crit Care Med (2001);
Müller B, et al. Crit Care Med (2000)
Carr J. J INT Care,2015

Patient X

45 years old

Obese

Diabetic

Day 4 Hospital admission

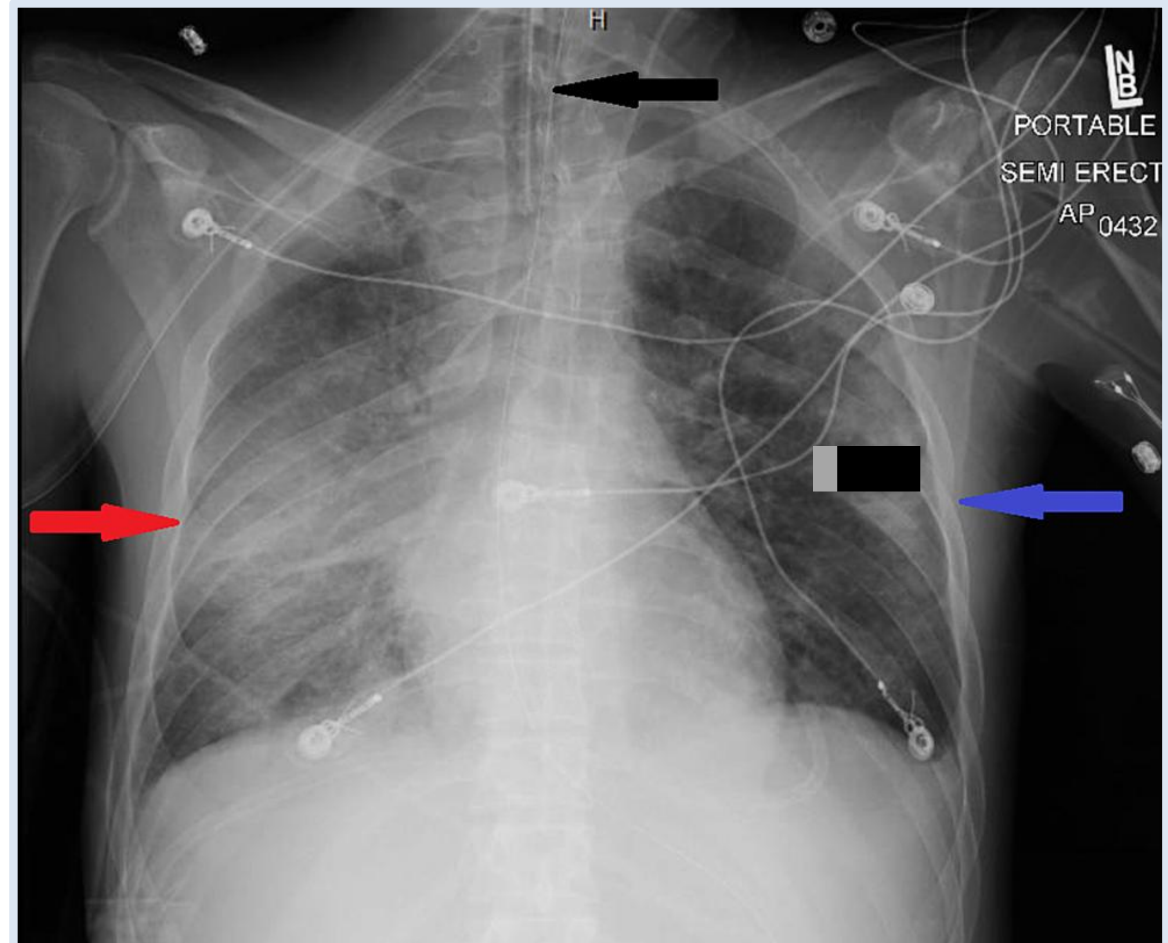
For elective repair large incisional hernia (delay)

HAP

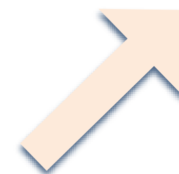
TF to ICU

Ventilation

Organ dysfunction



	Previous Day	Today Day 1	Day 2
TEMP	37.2^{0}C	39^{0}C	38.1^{0}C
HR	85	95-110	90-95
MAP	80	60	66
FiO2	RA	0.60	0.40
WCC	12	19	13.6
PLATELETS	155	150	160
BGL	7-9mmol/L		
CRP	45	150	155
PCT ng/mL	1.8	3.2	3.0
URINE	>1mL/Kg/Hour		
SCVO2		71	70
AVCO2		5	4
Fluid balance		1050	400



Hour 48

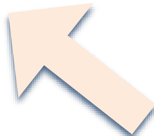
K. Pneumonia ESBL

De-escalate

<table>
<tr><th></th><th>Previous Day</th><th>Today Day 1</th><th>Day 2</th><th>Day 3</th><th>Day 4</th></tr>
<tr><td>TEMP</td><td>$37.2^{0}C$</td><td>$39^{0}C$</td><td>$38.1^{0}C$</td><td>$37.2^{0}C$</td><td>$37.6^{0}C$</td></tr>
<tr><td>HR</td><td>85</td><td>95-110</td><td colspan="3">90-95</td></tr>
<tr><td>MAP</td><td>80</td><td>60</td><td>66</td><td>65</td><td></td></tr>
<tr><td>FiO2</td><td>RA</td><td>0.60</td><td>0.40</td><td>0.4</td><td>0.35</td></tr>
<tr><td>WCC</td><td>12</td><td>19</td><td>13.6</td><td>13.4</td><td>11.7</td></tr>
<tr><td>PLATELETS</td><td>155</td><td>150</td><td>160</td><td>155</td><td>161</td></tr>
<tr><td>BGL</td><td colspan="5">7-9mmol/L</td></tr>
<tr><td>CRP</td><td>45</td><td>150</td><td>155</td><td>130</td><td>99</td></tr>
<tr><td>PCT ng/mL</td><td>1.8</td><td>3.2</td><td>3.0</td><td>1.6</td><td>0.6</td></tr>
<tr><td>URINE</td><td colspan="3">>1mL/Kg/Hour</td><td></td><td></td></tr>
<tr><td>SCVO2</td><td></td><td>71</td><td>70</td><td>70</td><td>70</td></tr>
<tr><td>AVCO2</td><td></td><td>5</td><td>4</td><td></td><td></td></tr>
<tr><td>Fluid balance</td><td></td><td>1050</td><td>400</td><td>-450</td><td>-400</td></tr>
</table>

	Previous Day	Today Day 1	Day 2	Day 3	Day 4
TEMP	37.2^{0}C	39^{0}C	38.1^{0}C	37.2^{0}C	37.6^{0}C
HR	85	95-110	90-95		
MAP	80	60	66	65	
FiO2	RA	0.60	0.40	0.4	0.35
WCC	12	19	13.6	13.4	
PLATELETS	155	150	160		161
BGL					
CRP	45	150	155	130	99
PCT ng/mL	1.8	3.2	3.0	1.6	0.6
URINE	>1mL/Kg/Hour				
SCVO2		71	70	70	70
AVCO2		5	4		
Fluid balance		1050	400	-450	-400

Antibiotic duration?



How long would you treat with Ertapenem?

1. Continue until Day 5 at least
2. Stop when the PCT is below 0.5 ng/mL
3. Stop when the PCT and CRP are both normal
4. Stop now as patient is clinically improved and PCT has declined significantly (80%).

If the pathogen was a MDR *Pseudomonas* the duration of therapy needs to be a minimum of 14 days ?

1. True
2. False

PCT guidance to stop antibiotics?

Limit antibiotic duration in an infection which is deemed to be adequately treated

Clinically improving and

- PCT threshold (<0.5ng/mL) OR
- **80% ↓ in PCT (kinetics)**

Efficacy and safety of procalcitonin guidance in reducing the duration of antibiotic treatment in critically ill patients: a randomised, controlled, open-label trial *Lancet Infect Dis* 2016

Evelien de Jong, Jos A van Oers, Albertus Beishuizen, Piet Vos, Wytze J Vermeijden, Lenneke E Haas, Bert G Loef, Tom Dormans,

- **Netherlands ICUs**
- **Antibiotic stewardship**
- **15 Centers**
- **n=1546**

Clinically improving AND

- **PCT threshold (≤0.5µg/L) OR**
- **80% ↓ in PCT (kinetics)**

De Jong et al, Lancet Infect Dis, 2016

Bouadma L et al, Lancet; 2010

Matthaiou DK et al, ICM, June 2012

Schuetz P et al , Coch Collab,2012

Soni NJ et al, J Hosp Med, Sept 2013

	Procalcitonin-guided group (n=761)	Standard-of-care group (n=785)	Between-group absolute difference in means (95% CI)	p value
Daily defined doses in first 28 days	7·5 (4·0 to 12·8)	9·3 (5·0 to 16·5)	2·69 (1·26 to 4·12)	<0·0001
Duration of treatment	5·0 (3·0 to 9·0)	7·0 (4·0 to 11·0)	1·22 (0·65 to 1·78)	<0·0001
Mortality (%)				
28-day mortality	149 (19·6%)	196 (25·0%)	5·4% (1·2 to 9·5)	0·0122
1-year mortality	265 (34·8%)	321 (40·9%)	6·1% (1·2 to 10·9)	0·0158
Costs				
Total cumulative costs of antibiotics	€150 082	€181 263	NA	NA
Median cumulative costs antibiotics per patient	€107 (51 to 229)	€129 (66 to 273)	€33·6 (2·5 to 64·8)	0·0006

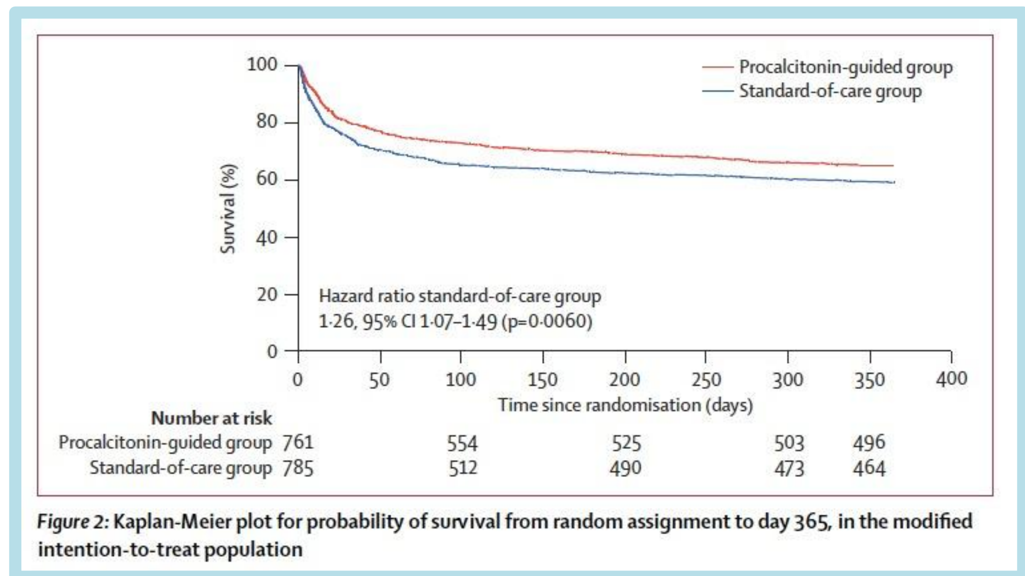


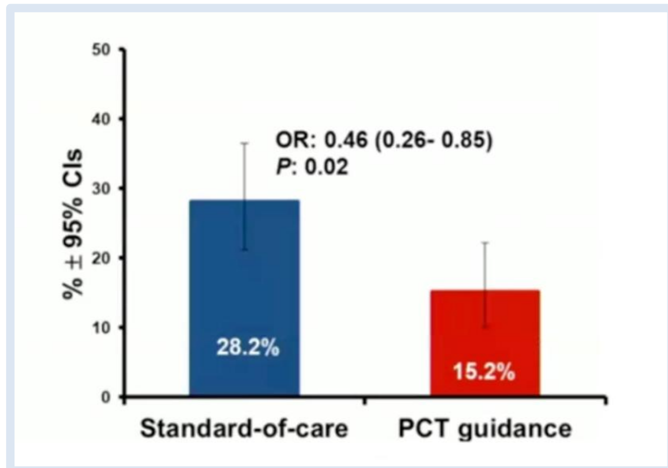
Figure 2: **Kaplan-Meier plot for probability of survival from random assignment to day 365, in the modified intention-to-treat population**

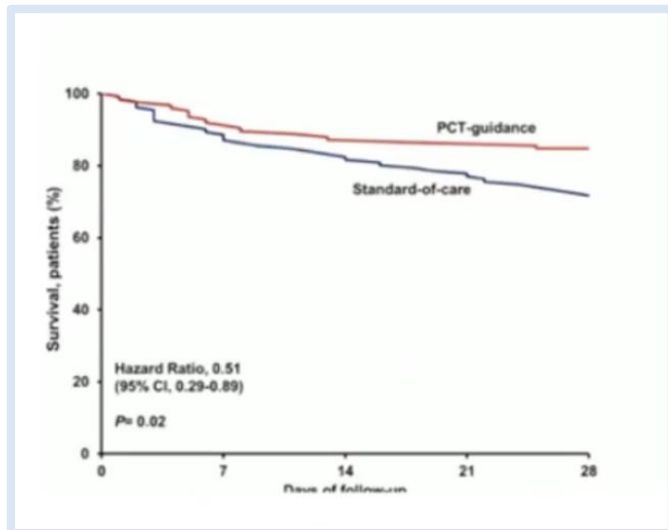
Less antibiotics
Mortality reduced
Safe

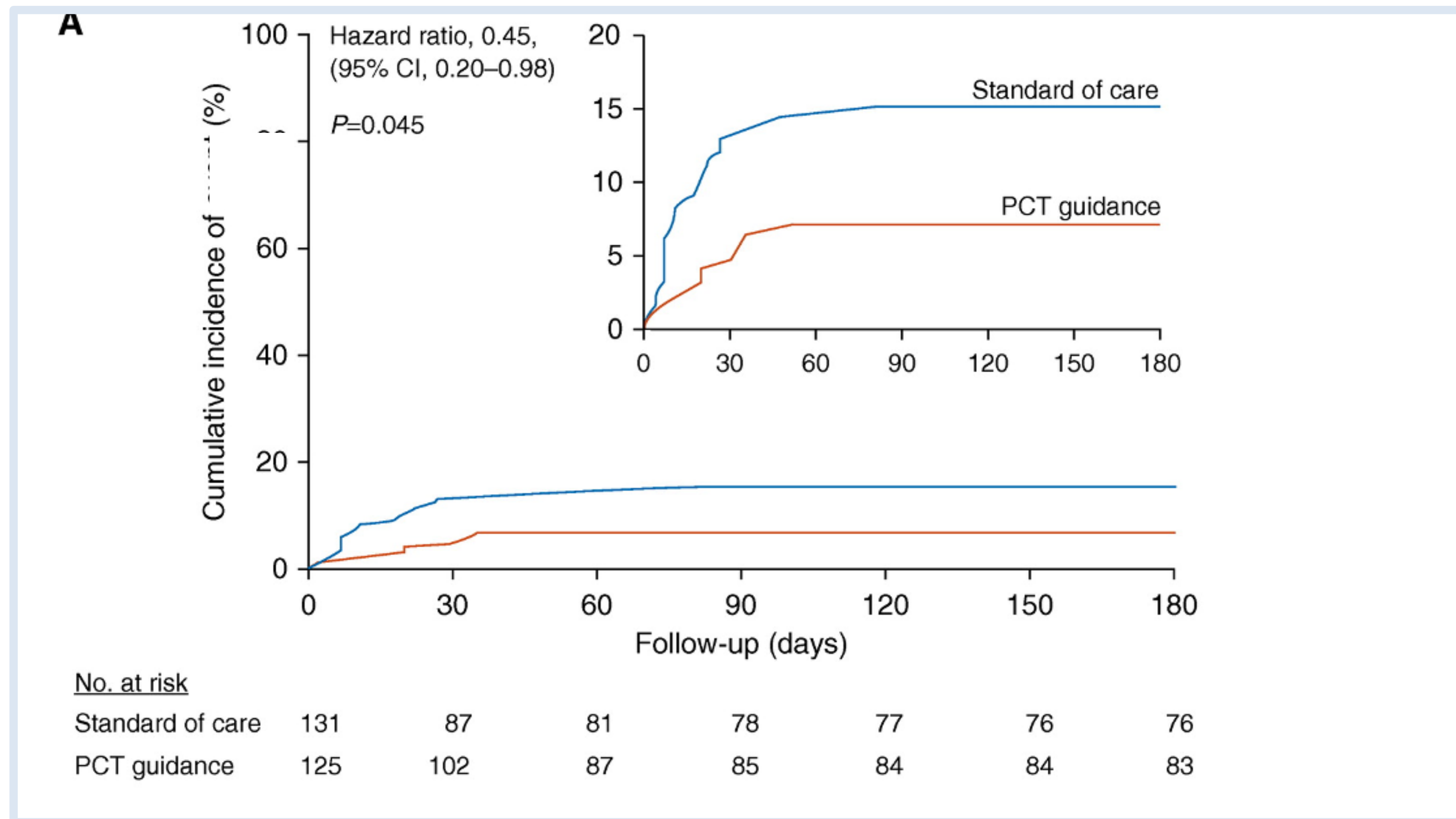
Procalcitonin to Reduce Long-Term Infection-associated Adverse Events in Sepsis. A Randomized Trial

AJRCC,2021

Evdoxia Kyriazopoulou [1], Lydia Liaskou-Antoniou [1], George Adamis [2], Antonia Panagaki [1], Nikolaos







Procalcitonin-guided antibiotic therapy may shorten length of treatment and may improve survival—a systematic review and meta-analysis

Márton Papp, Nikolett Kiss, Máté Baka, Domonkos Trásy, László Zubek, Péter Fehérvári, Andrea Harnos, Caner Turan, Péter Hegyi & Zsolt Molnár

Critical Care **27**, Article number: 394 (2023) | Cite this article

26 RCTs
(up to mid Nov 2022)

PCT guided
vs
Standard care

⇓ Antibiotic duration (⇓ 1.79 day)
⇓ Antibiotic use
⇓ D28 mortality(⇓ 16%)
Similar ICU and Hosp LOS
Recurrent infection

Biomarker-Guided Antibiotic Duration for Hospitalized Patients With Suspected Sepsis: The ADAPT-Sepsis Randomized Clinical Trial

JAMA

Paul Dark [1], Anower Hossain [2], Daniel F McAuley [3] [4], David Brealey [5], Gordon Carlson [6],

JAMA. 2025 Feb 25;333(8):682-693.

2761 patients

PCT guided protocol 918 patients	vs	CRP guided protocol 924 patients	vs	Standard care 918 patients

2761 patients
Multicentre

PCT guided protocol
918 patients

vs

CRP guided protocol
924 patients

vs

Standard care (SC)
918 patients

PCT group vs SC: Antibiotic duration⇩ 0.88 days p=0.01 (9.8 vs 10.6 days)

CRP group vs SC: Antibiotic duration no different p=0.79 (10.7 vs 10.6 days)

All cause mortality: PCT strategy noninferior (20.9%vs 21.1%; NI margin 5.4%)

JAMA. 2025 Feb 25;333(8):682-693.

	Previous Day	Today Day 1	Day 2	Day 3	Day 4
TEMP	37.2^{0}C	39^{0}C	38.1^{0}C	37.2^{0}C	37.6^{0}C
HR	85	95-110	90-95		
MAP	80	60	66	65	
FiO2	RA	0.60	0.40	0.4	0.35
WCC	12	19	13.6	13.4	11.7
PLATELETS	155	150	160	155	161
BGL	7-9mmol/L				
CRP	45	150	155	130	99
PCT ng/mL	1.8	3.2	3.0	1.6	0.6
URINE	>1mL/Kg/Hour				
SCVO2		71	70	70	70
AVCO2		5	4		
Fluid balance		1050	400	-450	-400

How long would you treat with Ertapenem?

1. Continue until Day 5 at least
2. Stop when the PCT is below 0.5 ng/mL
3. Stop when the PCT and CRP are both normal
4. Stop now as patient is clinically improved and PCT has declined significantly (80%).

If the pathogen was a MDR *Pseudomonas* the duration of therapy needs to be a minimum of 14 days ?

1. True
2. False

	Ward	Today Day 1	Day 2 ICU	Day 3 ICU	Day 4 ICU	Day 5 High care	Day 6 High care
TEMP	37.2^0C	39^0C	38.1^0C	37.2^0C	37.6^0C	37.2^0C	37.8^0C
HR	85	95-110	90-95			90	90
MAP	80	60	66	65	70	70	70
FiO2	RA	0.60	0.40	0.4	0.35	0.35	0.3
WCC	12	19	13.6	13.4	11.7	11	12
PLATELETS	155	150	160	155	161	161	180
BGL	7-9mmol/L						
CRP	45	150	155	130	99	55	40
PCT ng/mL	1.8	3.2	3.0	1.6	0.6	0.55	0.50
URINE	>1mL/Kg/Hour						

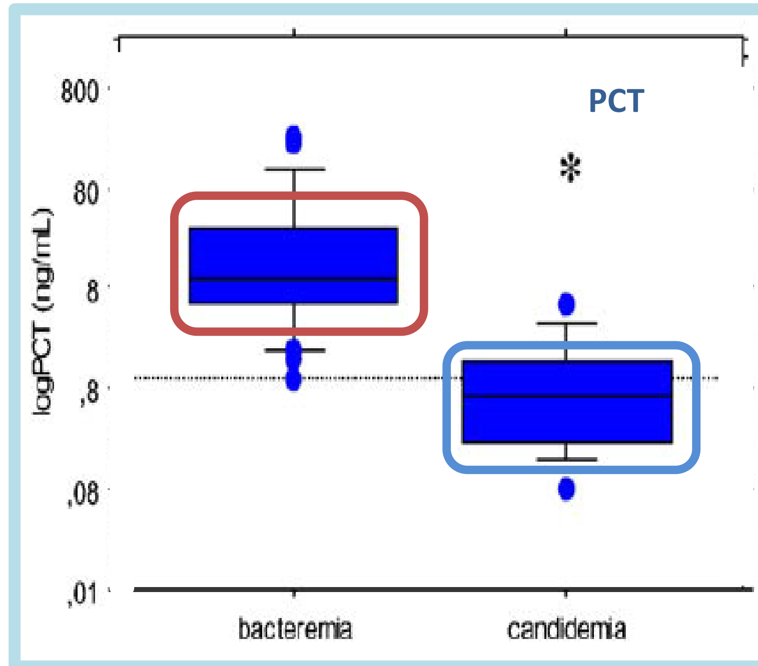
Discharged to HC Day 5

	Pre	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
TEMP ^0C	37.2	39	38.1	37.2	37.6	37.2	37.8	39.8
HR	85	95-110	90-95			90	90	140
MAP	80	60	66	65	70	70	70	59
FiO2	RA	0.60	0.40	0.4	0.35	0.35	0.3	Intubation
WCC	12	19	13.6	13.4	11.7	11	12	13.1
PLATELETS	155	150	160	155	161	161	180	145
BGL	7-9mmol/L							
CRP	45	150	155	130	99	55	40	180
PCT ng/mL	1.8	3.2	3.0	1.6	0.6	0.55	0.50	0.25
URINE	>1mL/Kg/Hour							

Is there an infection?

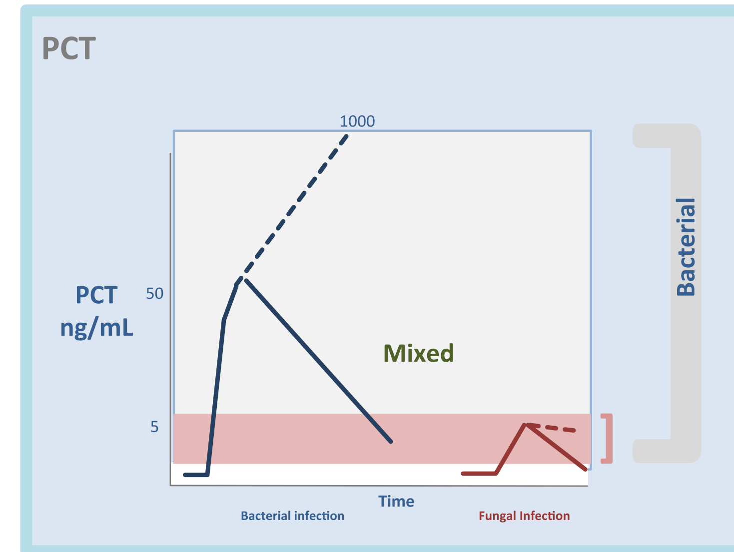
1. This is not an infection
2. Most likely a bacterial infection.
3. Need to consider *Candida* infection

PCT: Candidaemia



9.75 [1-259 ng/mL]

0.65 [0.08-5.46 ng/mL]



n=50 blood cultures
MICU
Non-neutropenic

$p < 0.001$

Pierre Emmanuel Charles*[1], Emmanuel Kus[1], Serge AHO[2],

Intensive Care Med (2006) 32:1577–1583

Serum procalcitonin measurement contribution to the early diagnosis of candidemia in critically ill patients

	Pre	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
TEMP ^{0}C	37.2	39	38.1	37.2	37.6	37.2	37.8	39.8
HR	85	95-110	90-95			90	90	140
MAP	80	60	66	65	70	70	70	59
FiO2	RA	0.60	0.40	0.4	0.35	0.35	0.3	Intubation
WCC	12	19	13.6	13.4	11.7	11	12	13.1
PLATELETS	155	150	160	155	161	161	180	145
BGL	7-9mmol/L							
CRP	45	150	155	130	99	55	40	180
PCT ng/mL	1.8	3.2	3.0	1.6	0.6	0.55	0.50	0.25
URINE	>1mL/Kg/Hour							

Is there an infection?

1. This is not an infection
2. Most likely a bacterial infection.
3. Need to consider *Candida* infection

	Pre	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 20	Day 21	Day 22	Day 23
TEMP ⁰C	37.2	39	38.1	37.2	37.6	37.2	37.8	39.8	37.8	37.5	37.2	37.8
HR	85	95-110	90-95			90	90	140	85	85	85	97
MAP	80	60	66	65	70	70	70	59	75	75	75	75
FiO2	RA	0.60	0.40	0.4	0.35	0.35	0.3	Intubation	RA	RA	RA	RA
WCC	12	19	13.6	13.4	11.7	11	12	13.1	8	7	6	8
PLATE LETS	155	150	160	155	161	161	180	145	180	185	167	177
BGL	7-9mmol/L											
CRP	45	150	155	130	99	55	40	180	25	22	29	57
PCT ng/mL	1.8	3.2	3.0	1.6	0.6	0.55	0.50	0.25	0.20	0.10	0.10	0.35
URINE	>1mL/Kg/Hour											

Day 7-20 Micafungin C albicans

Day 15 Extubated

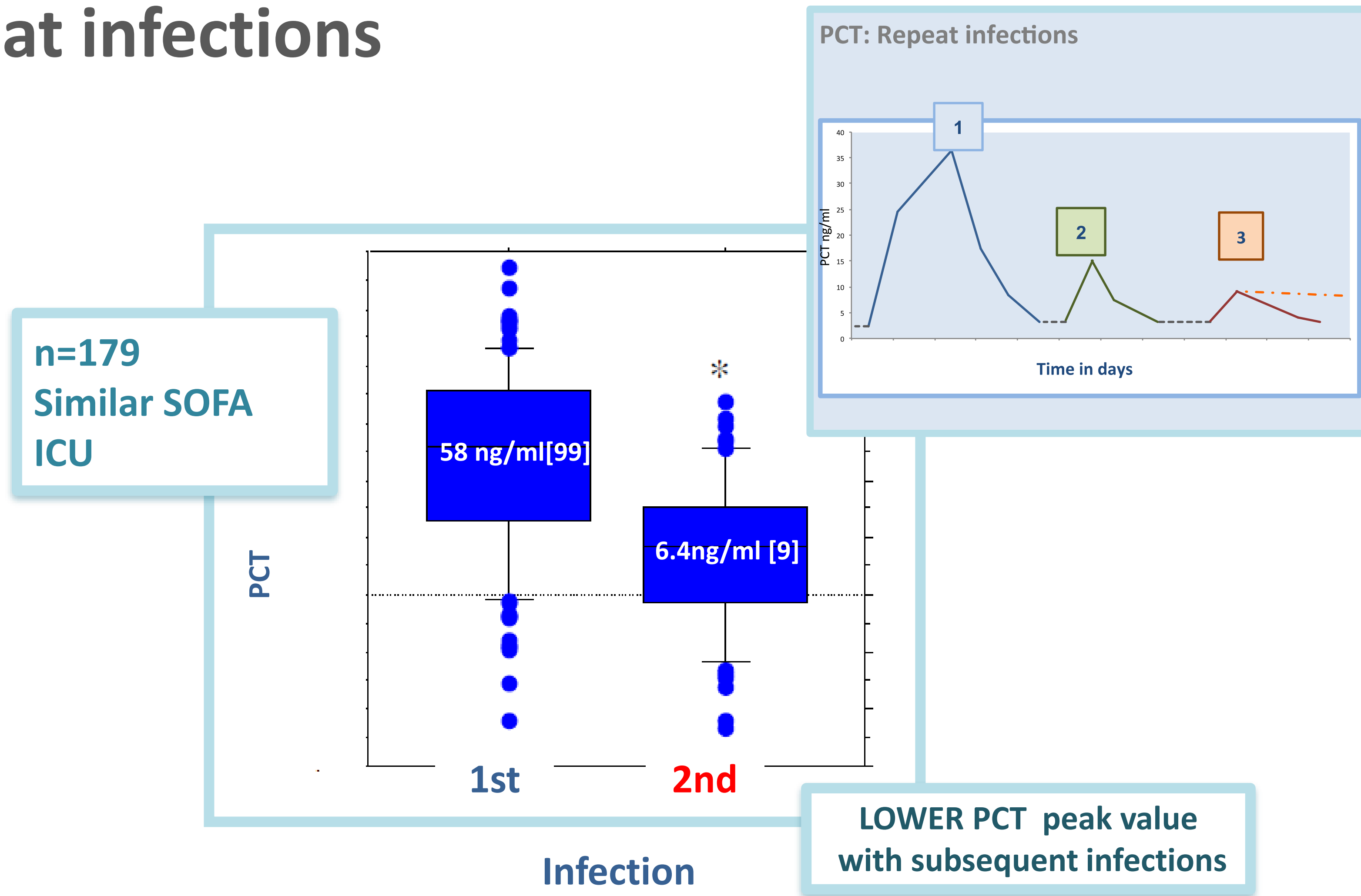
Day 17 High Care

Day 21 Ward

1. Yes

2. No

Peak PCT: Repeat infections



Research article

Open Access

Impact of previous sepsis on the accuracy of procalcitonin for the early diagnosis of blood stream infection in critically ill patients

Charles at al.: BMC Infectious Disease 20098

	Pre	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 19	Day 21	Day 22	Day 23
TEMP ⁰C	37.2	39	38.1	37.2	37.6	37.2	37.8	39.8	37.8	37.5	37.2	37.8
HR	85	95-110	90-95			90	90	140	85	85	85	97
MAP	80	60	66	65	70	70	70	59	75	75	75	75
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URINE	>1mL/Kg/Hour											

Day 7-19
Micafungin
C albicans

Day 15
Extubated

Day 17
High Care

Day 21
Ward

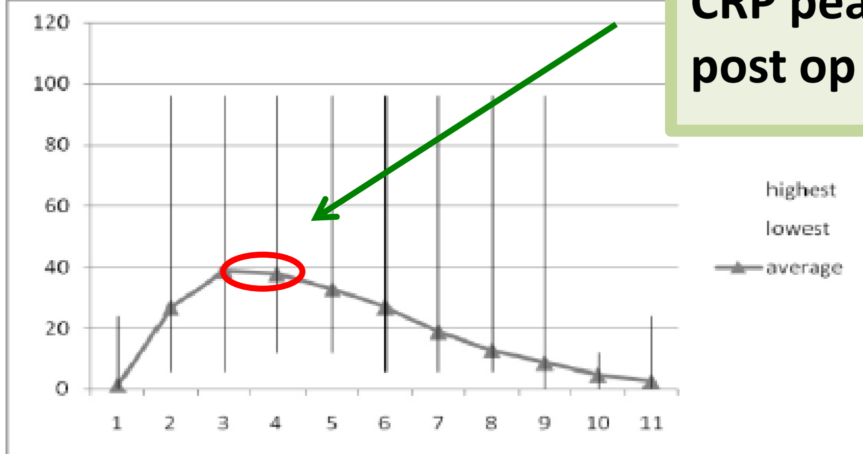
1. Yes
2. No

Patient AB

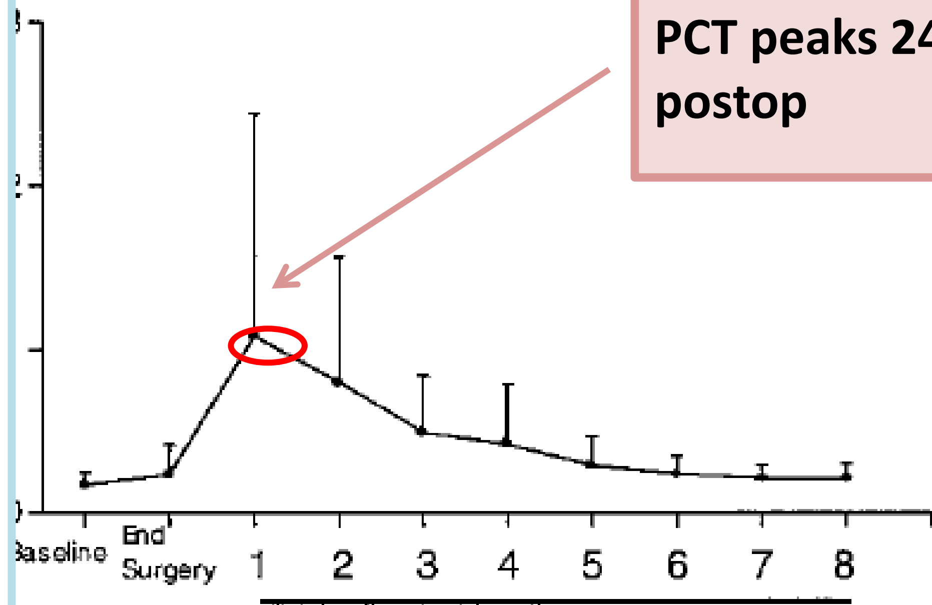
45 years old
Obese
Diabetic

Hospital admission
For elective repair large incisional hernia

Finally rescheduled for surgery
Can the PCT be used postoperatively to adjudge surgical complications or infections



CRP peaks D3-4 post op



PCT peaks 24 hours postop

Review Article

Page 1 of 13

Monitoring the post surgery inflammatory host response

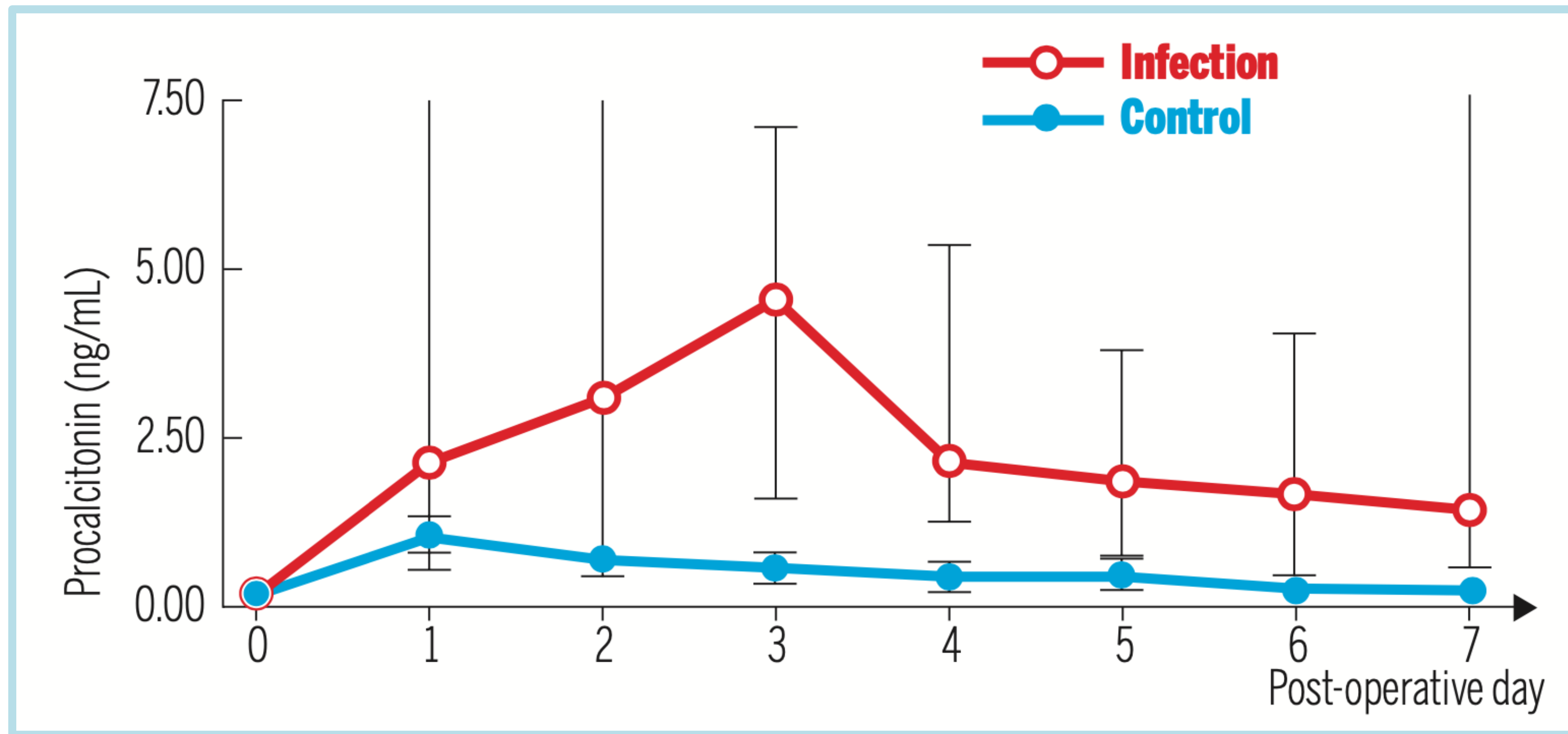
Fathima Paruk, Julian M. Chausse

Journal of Emergency and Critical Care Medicine, 2019

Department of Critical Care, Steve Biko Academic Hospital and Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa

PCT Response
Abdominal > Sternotomy >Thoracic

CRP and PCT Post surgery



Adapted from Jebali MA *et al.* Anesthesiology 2007;107:232-8

PCT Post surgery

Review Article *J Emerg Crit Care Med* 2019;3:47 Page 1 of 13

Monitoring the post surgery inflammatory host response

Fathima Paruk, Julian M. Chausse

Department of Critical Care, Steve Biko Academic Hospital and Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa

PCT Response

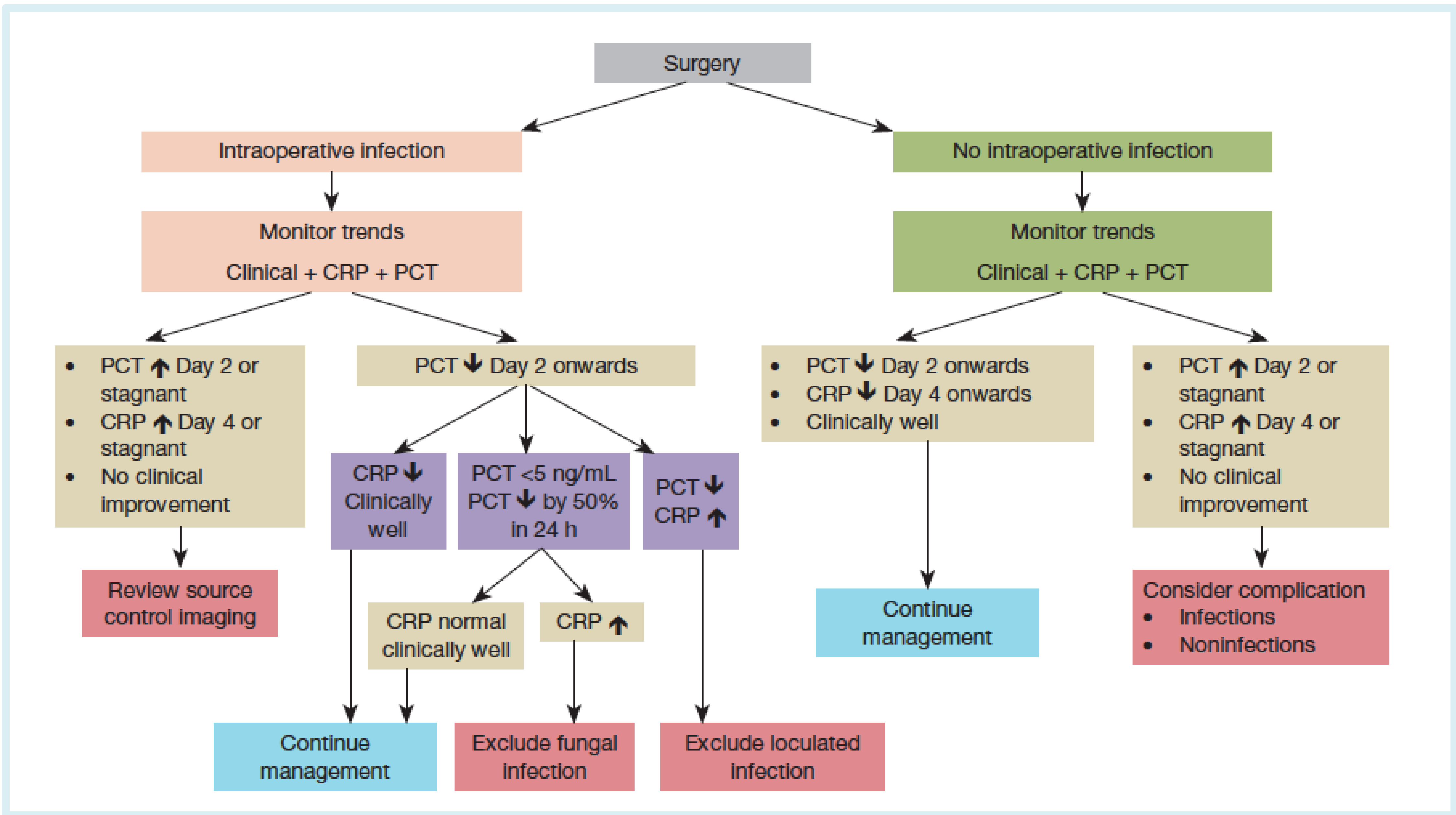
- Detect ongoing sepsis
- Detect new sepsis
- Detect post op complications

Post surgery

Concern if:

- PCT >10ng/mL
- From 48 hours PCT stagnant or⇧

Kinetics and Clearance



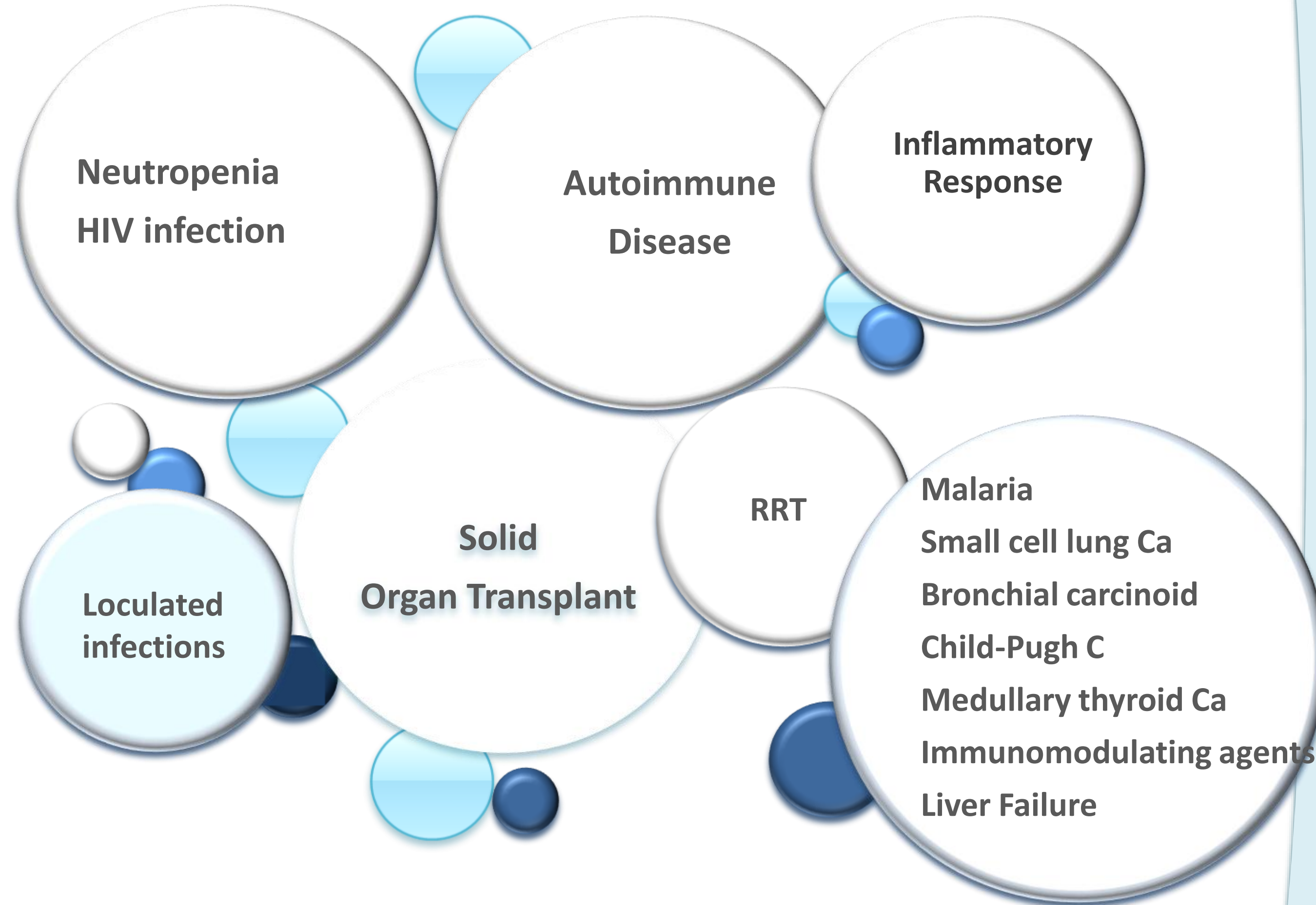
Monitoring the post surgery inflammatory host response

Fathima Paruk, Julian M. Chausse

Journal of Emergency and Critical Care Medicine, 2019

Post surgery

Special situations



Immunesupression

Renal dysfunction

Chronic kidney disease

- PCT elevated in 1/3 (stage V, Dialysis)
- Bacterial infection
  - PCT increases
  - Rate of clearance with resolution of sepsis unchanged

RRT

- PCT drops on initiation (depends on type of RRT)
- Intermittent RRT- 3 hours
- CVVHD- massive decline within 15 min

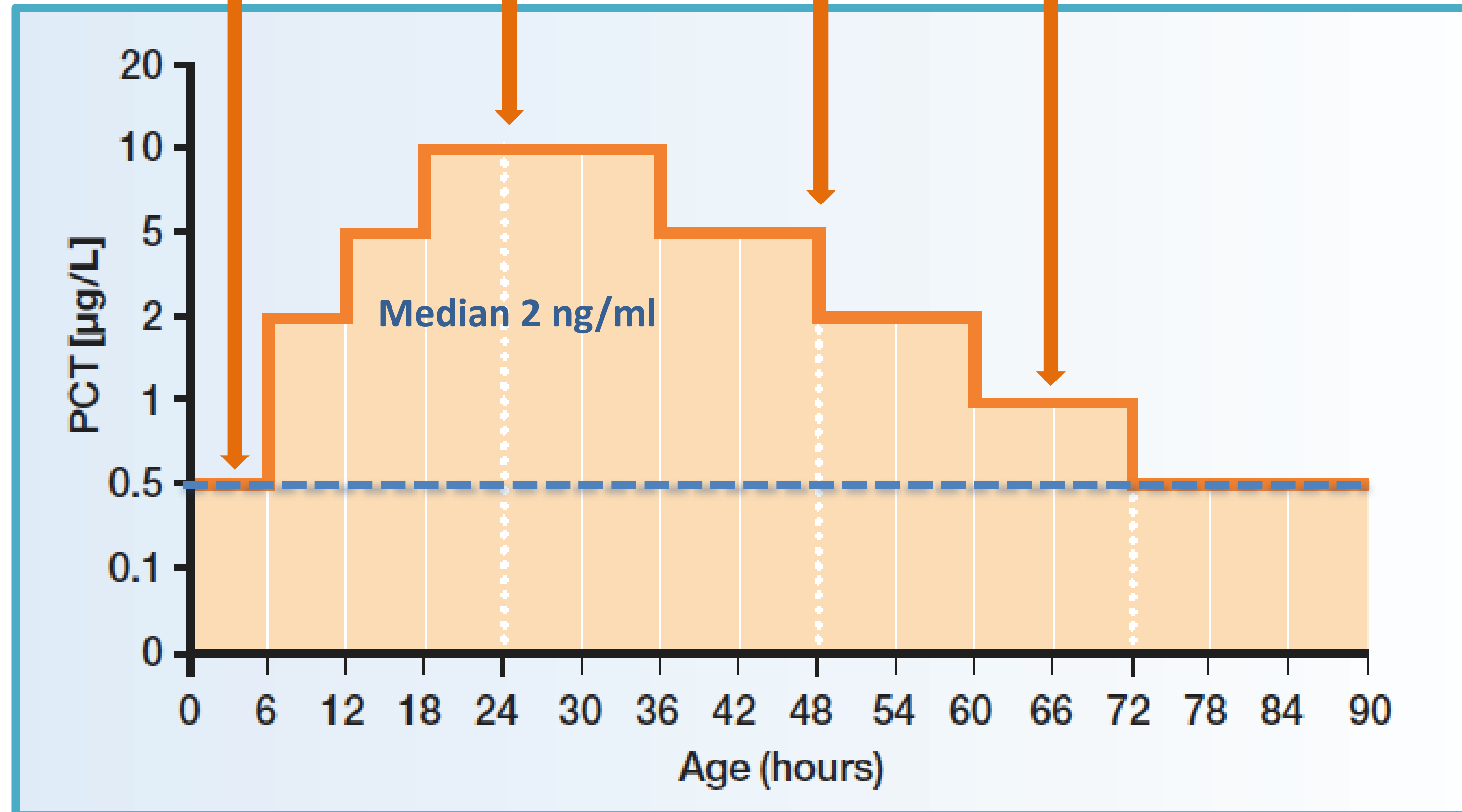
Relationship between acute kidney injury and serum procalcitonin (PCT) concentration in critically ill patients with influenza infection

A. Rodríguez[a,*], L.F. Reyes[b], J. Monclou[a], B. Suberviola[c], M. Bodí[a], G. Sirgo[a], J. Solé-Violán[d], J. Guardiola[e], D. Barahona[f], E. Díaz[g], I. Martín-Loeches[h], M.I. Restrepo[b], on behalf GETGAG study group[1]

Neonates

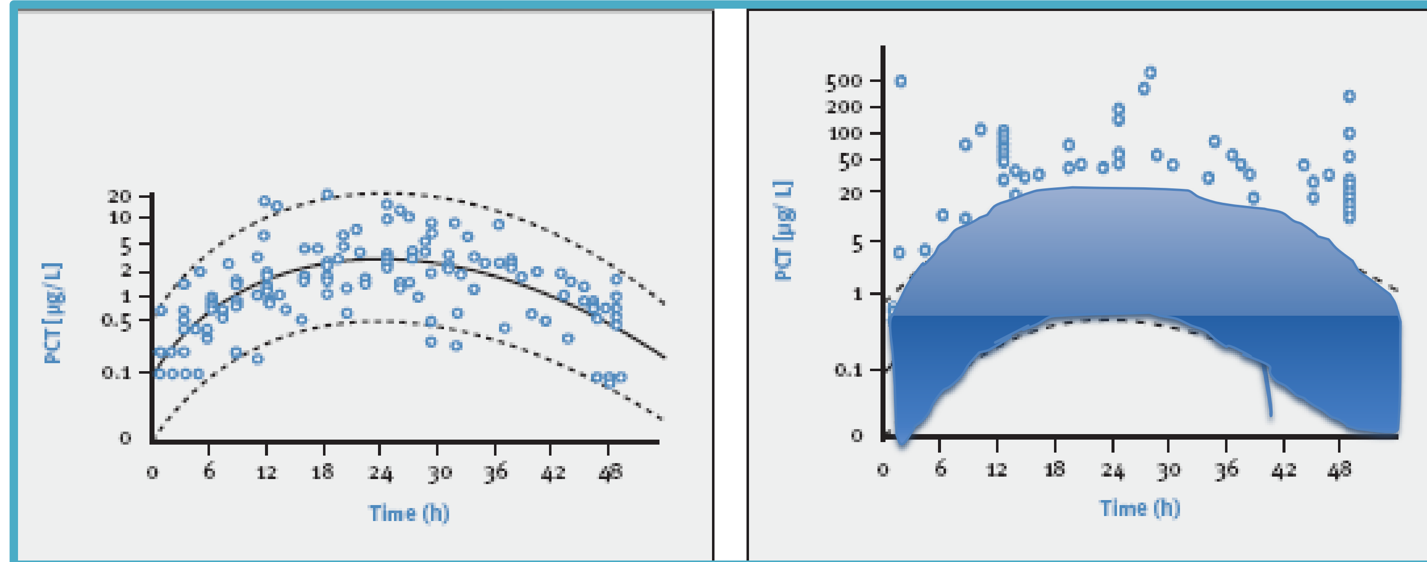
Immature immune system

Nonspecific signs and symptoms



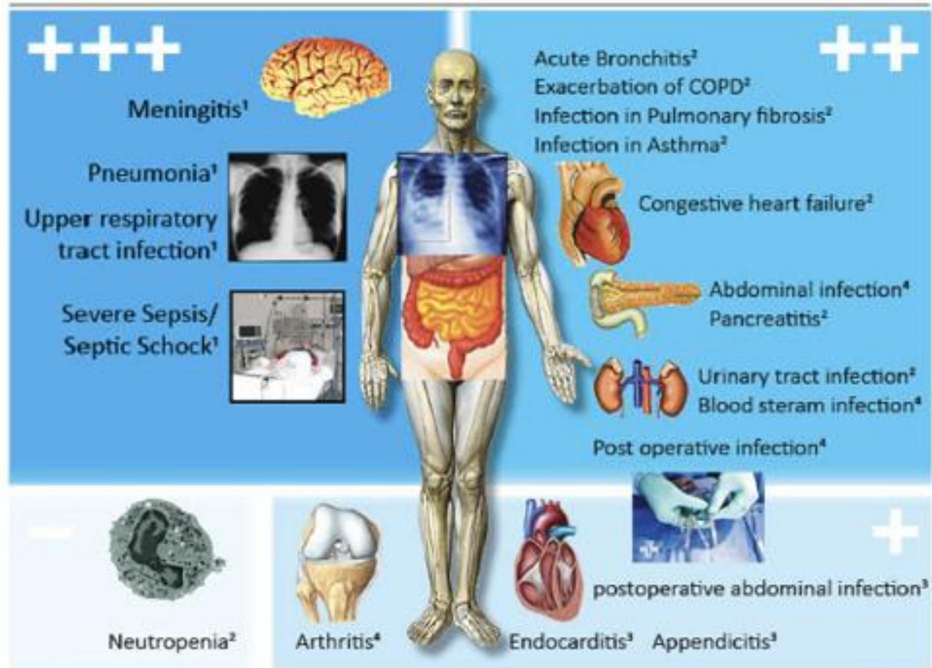
Early onset neonatal sepsis

Infection



Clear differentiation between infected and uninfected neonates possible by application of age-related reference values

C Chiesa et al. CID 1997



Sager et al. BMC Medicine (2017) 15:15
DOI 10.1186/s12916-017-0795-7

Primary care

Emergency department

General ward

Critically ill

KINETICS OF PROCALCITONIN IN INFECTIONS CAUSED BY MULTIDRUG-RESISTANT BACTERIA

IVÁN HUESPE[1,2], EDUARDO PRADO[1], INÉS STANELONI[3], NICOLÁS CONTRERA[1], LISANDRO DENADAY[4], EDUARDO SAN ROMAN[1], JORGE SINNER[1]

DE GRUYTER

Opinion Paper

Philipp Schuetz*, Albertas Beishuizen, Michael Broyles, Ricard Ferrer, Gaetan Gavazzi, Eric Howard Gluck, Juan González del Castillo, Jens-Ulrik Jensen, Peter Laszlo Kanizsai, Andrea Lay Hoon Kwa, Stefan Krueger, Charles-Edouard Luyt, Michael Oppert, Mario Plebani, Sergey A. Shlyapnikov, Giulio Toccafondi, Jennifer Townsend, Tobias Welte and Kordo Saeed

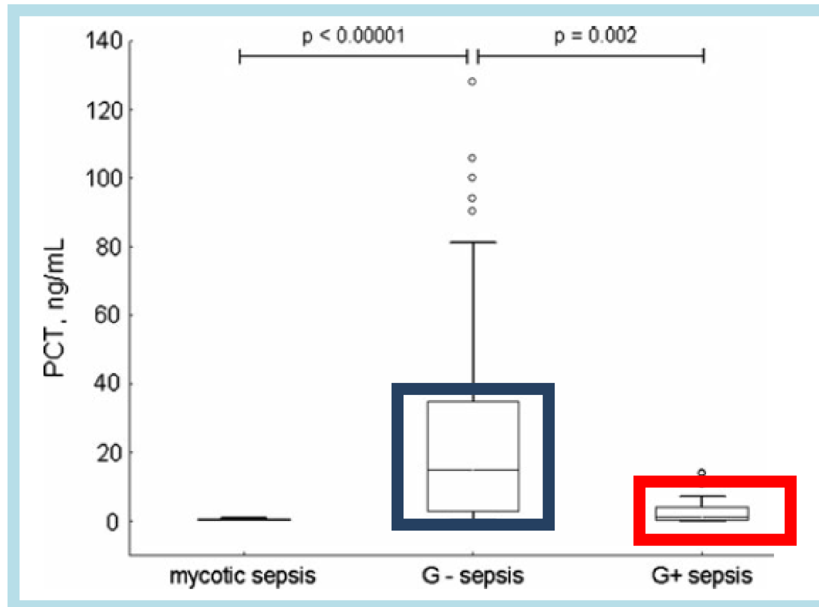
Procalcitonin (PCT)-guided antibiotic stewardship: an international experts consensus on optimized clinical use

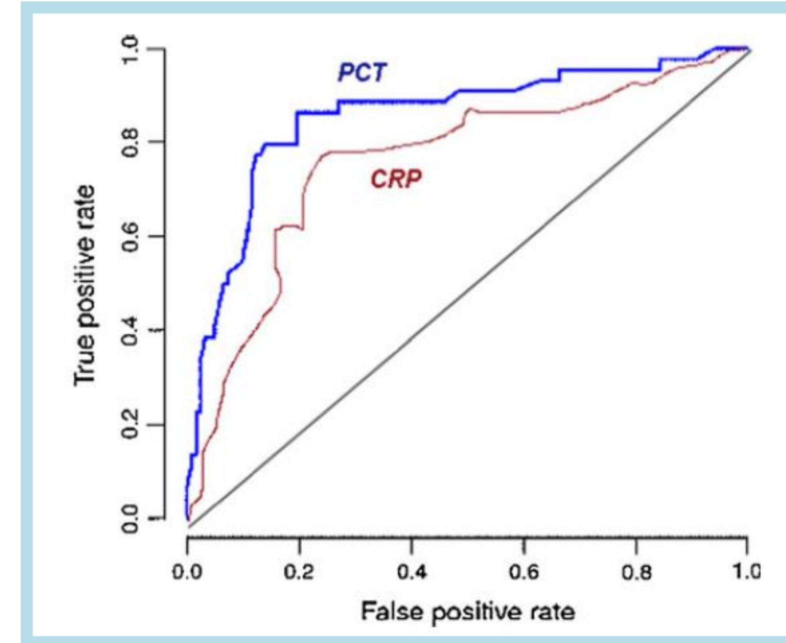
Procalcitonin-guided diagnosis and antibiotic stewardship revisited

Ramon Sager[1,2], Alexander Kutz[1,2], Beat Mueller[1,2] and Philipp Schuetz[1,2*]

Evidence

PCT: G+ vs G- infections





8.9 [1.8-32 ng/mL]

0.73 [0.2-3.4 ng/mL]

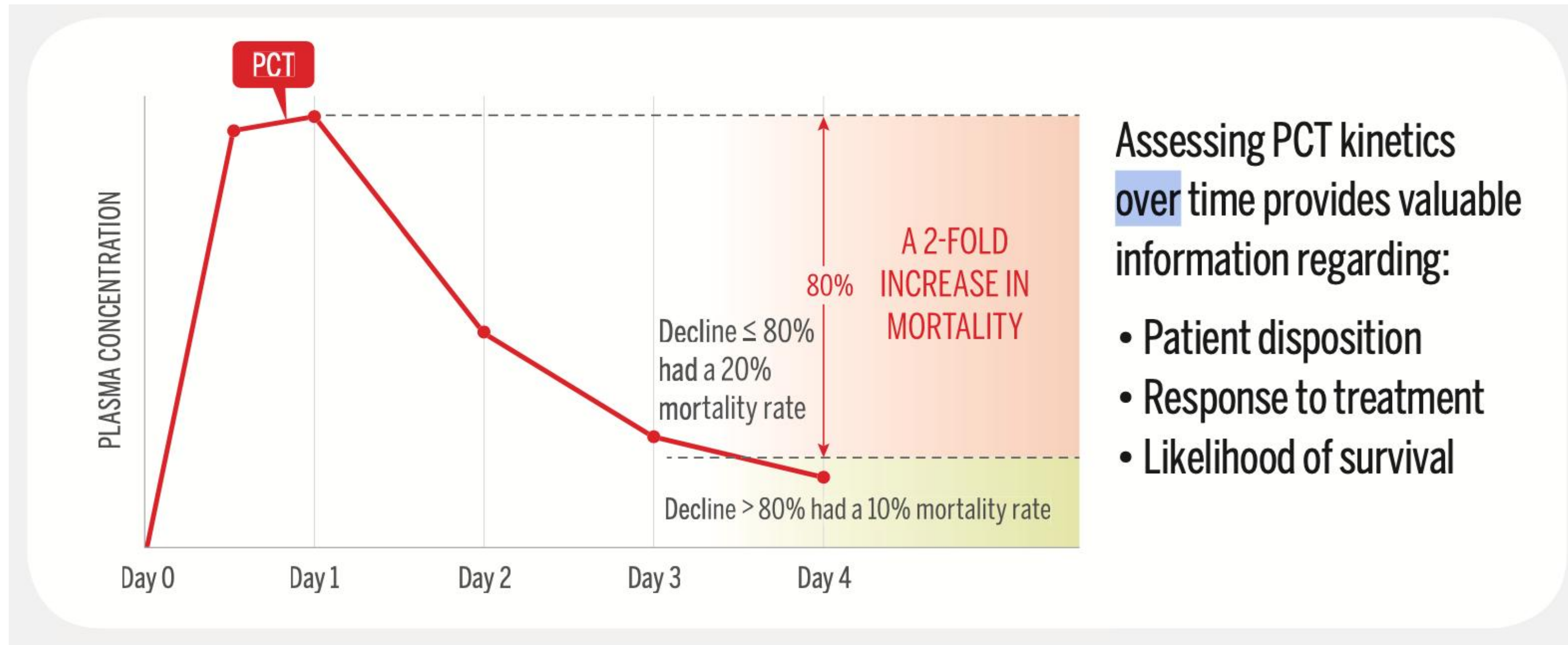
Significantly higher procalcitonin levels could differentiate Gram-negative sepsis from Gram-positive and fungal sepsis

Helena Brodská · Karin Malíčková · Václava Adámková · Hana Benáková · Markéta Marková Šťastná · Tomáš Zima

n=166 Blood cultures

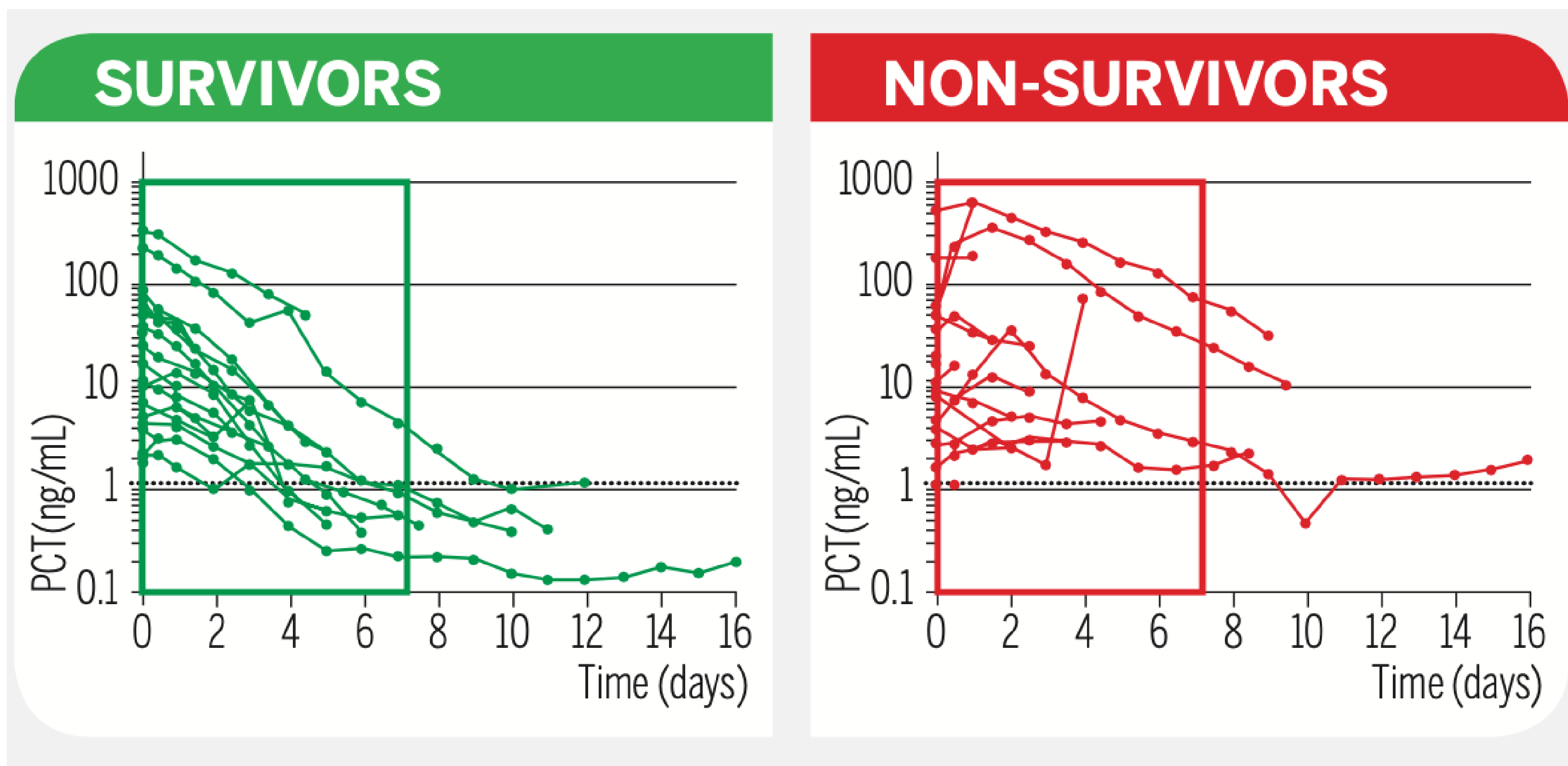
Clin Exp Med (2013) 13:165–170
DOI 10.1007/s10238-012-0191-8

Prognosis



Adapted from Schuetz P, ***et al***. Crit Care Med. 2017; 45(5):781–789

Prognosis



Adapted from Harbarth S., *et al.* Am J Respir Crit Care Med. 2001;164:396-402

AI and PCT

Cost-Effectiveness Analysis of a Procalcitonin-Guided Decision Algorithm for Antibiotic Stewardship Using Real-World U.S. Hospital Data

OMICS A Journal of Integrative Biology
Volume 23, Number 10, 2019

Anne M. Voermans,[1] Janne C. Mewes,[1] Michael R. Broyles,[2] and Lotte M. G. Steuten[3,*]

costs per patient, and numbers of patients with *Clostridium difficile* and antibiotic resistance (ABR) infections. We found that health care with the PCT decision algorithm for hospitalized sepsis and LRTI patients resulted in shorter length of stay, reduced antibiotic use, fewer mechanical ventilation days, and lower numbers of patients with *C. difficile* and ABR infections. The PCT-guided health care resulted in cost savings of $25,611 (49% reduction from standard care) for sepsis and $3630 (23% reduction) for LRTI, on average per patient. In conclusion, the PCT decision algorithm for ABS in sepsis and LRTI might offer cost savings in comparison with standard care in a U.S. hospital context. To the best of our knowledge, this is the first health economic analysis on PCT implementation using U.S. real-world data. We suggest that future CEA studies in other U.S. and worldwide settings are warranted in the current age when PCT and other decision algorithms are increasingly deployed in precision therapeutics and evidence-based medicine.

PCT Group

- Antibiotic exposure reduced
- ICU LOS reduced
- C diff reduced
- Cost-<25 000 USD(sepsis)
- Cost <3 630USD(RTI)

Impact of Procalcitonin-Guided Antibiotic Management on Antibiotic Exposure and Outcomes: Real-world Evidence

Michael R. Broyles[1]

September 2017

Open Forum Infectious Diseases

985 (control) vs 1167 (PCT guided)

Significant reduction

- Antibiotic exposure
- Adverse events

Impact: LOS, ICU cost, Pharmacy cost, antibiotic exposure

CHEST 2017; 151(1):23-33

Effect of Procalcitonin Testing on Health-care Utilization and Costs in Critically Ill Patients in the United States

Robert A. Balk, MD; Sameer S. Kadri, MD; Zhun Cao, PhD; Scott B. Robinson, MA, MPH; Craig Lipkin, MS; and Samuel A. Bozzette, MD, PhD

33 569 PCT guided vs 98 543 non-PCT guided

Reduced antibiotic exposure

CONCLUSIONS: Use of PCT testing on the first day of ICU admission was associated with significantly lower hospital and ICU lengths of stay, as well as decreased total, ICU, and pharmacy cost of care. Further elucidation of clinical outcomes requires additional data.

RESEARCH ARTICLE

The cost impact of PCT-guided antibiotic stewardship versus usual care for hospitalised patients with suspected sepsis or lower respiratory tract infections in the US: A health economic model analysis

Janne C. Mewes[1], Michael S. Pulia[2], Michael K. Mansour[3,4], Michael R. Broyles[5], H. Bryant Nguyen[6,7], Lotte M. Steuten[1,8,9*]

PLOS ONE | https://doi.org/10.1371/journal.pone.0214222 April 23, 2019

Critically ill patients (ICU/HC)
Daily*

Ward
Every 48 hours post surgery

Every 48 hours if planning to use the PCT to stop antibiotic therapy

Immediately when infection/sepsis suspected

Frequency of Monitoring

Clinical context matters

Embed PCT in stewardship and education

PCT is a tool - Not a rule

MDT

PCT kinetics

Clinical context matters