Time to act:

#STOPSEPSISEU
Welcoming remarks

MEP Simona Bonafè
ing) (Italy, S&D)
Opening remarks
Brian Maguire
EURACTIV Journalist
Burden of Sepsis in Europe
Inclusion of sepsis in the AMR debate

Dennis Kredler
Global Sepsis Alliance
The Burden of Sepsis: Idea for EU Action

Dennis Kredler
Sepsis Survivor
Vice President, Global Sepsis Alliance
SEPSIS: MY STORY
This is not me – but I looked very similar.

Source: ecmofamilysupport.com
SEPSIS: THE BURDEN
Sepsis in Europe

More than 3 million cases per year

YES. 3 MILLION.
Sepsis in Europe

Cost to European health systems: €300 billion

IN 2019.
Sepsis in Europe

Each year, 2 million survivors may suffer long term disabilities

I AM ONE OF THEM.
Sepsis in Europe

2,000 people will die from sepsis TODAY.
... AND TOMORROW...
... AND ON FRIDAY...
Sepsis in Europe

That’s about 680,000 deaths each year

THAT MAKES SEPSIS THE MAJOR CAUSE OF PREVENTABLE DEATHS.
SEPSIS: WHAT THE EU CAN DO
What Can the EU Do?

• Collect harmonized data on the incidence of sepsis
• Facilitate exchange of best practice on sepsis prevention and sepsis response between Member States
• Support Member States in their work to establish national sepsis action plans in line with World Health Assembly commitments
• Work towards the introduction of sepsis protocols in all hospitals
A World Free of Sepsis!

www.global-sepsis-alliance.org
www.world-sepsis-day.org

September 13, 2019
World Sepsis Day
Burden of Sepsis in Europe

Inclusion of sepsis in the AMR debate

Charles Price
DG SANTE, European Commission
Exchange of views

Moderated by Brian Maguire
Exchange of views

Adoption and implementation of national programmes: exchanging best practices

Giulio Toccafondi
Tuscany Region (Italy)
Giulio Toccafondi
Clinical Risk Management and Patient Safety Center - Tuscany Region
WHO - Collaborating Centre in Human Factors and Communication for the Delivery of Safe and Quality Care
Chair of Quality improvement committee - Global Sepsis Alliance
Sepsis is an emergency

1.4 millions
Cases of Sepsis in Europe in 2014

40%
40% of patients with sepsis die

€16,000
Cost of hospital stay caused by sepsis

17.5%
Of survivors are readmitted to hospital
(30 days post initial admission for sepsis)
How many European countries have a national plan to combat sepsis?
How many European countries have a national plan to combat sepsis?

NONE
Tuscany Region Healthcare – Sepsis Program 2018-2020

MULTIDISCIPLINARY WORKING GROUP + RISK BASED APPROACH

Intesivist, Surgeon, Infectivologist, Microbiologist, Emergency Physician, General Practitioner, Emergency Services Manager, Quality Manager, Internal Medicine Physician, Obstetrics and Gynecology Physician, Public Heath Manager, Clinical Risk Manager, Human Factor Expert

Section 1 – Open the view
Why to tackle sepsis it is necessary to detect infection risk and coding Sepsis (ICD) coherently

Section 2 – Three stewardships
AMStewardship
Diagnostic Stewardships
Sepsis Stewardship
Why are they linked

Section 3 – Act Fast
If we did not manage To prevent sepsis
We have to treat it
Situated best practice
Focus on Source Control

https://www.ars.toscana.it/lotta-alla-sepsi/lottaAllaSeps_stewardships Call To Action
We Called for five Actions

We are gaining allies for making those real and give visibility to champions

1 - From home to the emergency dept. > LEGACY OF G.Ps, EMERGENCY SERVICES, ED

2 – Full implementation of the Sepsis Pathaway in hospital > ONE SEPSIS WORKFLOW

3 – Promote sepsis awarness > G.Ps AS SEPSIS EVANGELISTS

4 – The asset > AUTONOMOUS AND NETWORKED CLINICL MICROBIOLOGY UNITS

5 – Surgcical Source Control > MAKING SOURCE CONTROL VIABLE AND REAL
Giornata Mondiale di Lotta alla Sepsi in Toscana

Lotta alla Sepsi, Call to Action, Capacità di Risposta

Evento promosso dal Centro Gestione Rischio Clinico della Regione Toscana e dall’Agenzia Regionale di Sanità della Regione Toscana in collaborazione con l’Università di Siena

INTERVENGONO
Stefano Scaramelli
Presidente Terza Commissione
Consiglio Regionale della Toscana

Francesco Frati
Rettore dell’Università di Siena

13 Settembre 2019 | Siena
Sala Calvino - Centro Congressi Italo Calvino - Complesso Santa Maria della Scala
Sepsis cases in Tuscan Healthcare system

**Emergency Departement: 84%**

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<tr>
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<th>%</th>
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<td>2093</td>
<td>11.23</td>
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<td></td>
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<td></td>
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<tr>
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<td>Surgical</td>
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<tr>
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<td>Medical</td>
<td>13483</td>
<td>72.35</td>
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</table>

Sepsis cases 2017-2018

18,635

558 death with diagnosis sepsis/septic shock at the ED
What is sepsis?

**World Sepsis Day Infographics**

**What Is Sepsis?**

**Sepsis** arises when the body’s response to an infection injures its own tissues and organs. It may lead to shock, multi-organ failure, and death – especially if not recognized early and treated promptly.

**Awareness saves lives.**

Learn about sepsis at [www.world-sepsis-day.org](http://www.world-sepsis-day.org)

[www.global-sepsis-alliance.org](http://www.global-sepsis-alliance.org)
Infections
(also Hospital Acquired and MDR)

- Sepsis
- Septic Shock
Infections
(also Hospital Acquired and MDR)
What is certain in sepsis

Time to Treatment and Mortality during Mandated Emergency Care for Sepsis

**SEPSIS**

rapid administration of antibiotics (1-3 hours) reduces pathogen burden, modifies the host response, and could reduce the incidence of subsequent organ dysfunction.
What is certain in sepsis

SEPTIC SHOCK

In the case of septic shock it is necessary to act IMMEDIATELY with the administration within the first hour of antibiotics, fluids and vasopressors.

P. E. Marik and J. D. Farkas, Crit. Care Med., 2018.
What is **uncertain** in sepsis?

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<th></th>
<th>AMI</th>
<th>Stroke</th>
<th>Trauma</th>
<th>Sepsis</th>
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<tr>
<td>Clinical diagnosis</td>
<td>clear</td>
<td>clear</td>
<td>clear</td>
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<tr>
<td>Population</td>
<td>homogeneous</td>
<td>homogeneous</td>
<td>heterogeneous</td>
<td>heterogeneous</td>
</tr>
<tr>
<td>Specific bio-marker</td>
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<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Complexity in treatment</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Multisectoral approach</td>
<td>+</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
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<tr>
<td>Guidelines</td>
<td>+++</td>
<td>+++</td>
<td>++++</td>
<td>++</td>
</tr>
<tr>
<td>Experience</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Dedicated healthcare unit</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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</table>
What is necessary in sepsis?

Infectious Diseases Society of America (IDSA) POSITION STATEMENT: Why IDSA Did Not Endorse the Surviving Sepsis Campaign Guidelines

IDSA did not endorse the 2016 Surviving Sepsis Campaign Guidelines despite being represented in the working group that drafted the guidelines document. Leadership from the IDSA, the Surviving Sepsis Campaign Guidelines, and the Society of Critical Care Medicine had numerous amicable discussions primarily regarding the bolded, rated guidelines recommendations. Our societies had different perspectives, however, regarding the interpretation of the major studies that informed the guidelines’ recommendations, thus leading us to different conclusions and different perspectives on the recommendations. IDSA consequently elected not to endorse the guidelines. IDSA nonetheless hopes to be able to continue collaborating with the Surviving Sepsis Campaign and the Society of Critical Care Medicine to resolve our differences and to develop further strategies together to prevent sepsis and septic shock as well as reduce death and disability from these conditions both nationally and globally.

Keywords. Surviving Sepsis; Guidelines; Endorsement; IDSA.

SUSPECT SEPSIS

In patients with suspected sepsis, the goal is to start antibiotic therapy immediately but with the commitment of all operators to reduce it to a shorter duration while maintaining all safety margins and the greatest possible benefits (AMR).

Reduce time from empirical AM therapy to TARGETED Antinicrobial Therapy
What is infection?
What is risk?

hazards  Vulnerabilities
are we able to use all the information we have regarding Infection risks and suspect of sepsis?

**RISK BASED APPROACH**

- Dangerous micro-organisms and resistance mechanisms
- Patients co-morbidities and impaired host response
- hospitals not implementing coordinated infection prevention and control, Antimicrobial stewardship, Rapid identification and Sepsis Management
- Behaviour Continued
  - Empirical antimicrobial therapy

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**hazards**

**Vulnerabilities**
make explicit vulnerabilities and hazards of host, pathogen, healthcare organization (environment) and improve
Infection management: Unifying the Forces

Need to be integrated into a comprehensive strategy.
Infection Management

- RIMS: Rapid identification and management of sepsis
- AMS: Integrated Stewardship (diagnostic + antimicrobial)
- IPCS: Infection Prevention Control and Surveillance

Knowledge of Vulnerabilities and Hazards regarding infections
Hazards: disregulated host response to infection, aspecific symptoms, time dependancy, lack of specific biomarkers

Vulnerabilities: risk factors not considered or understimation of warnings signs, lack of awareness and focus, not shared plan available for activating resources, high risk patients comorbidities, healthcare setting not appropriate for treating sepsis

RIMS - Rapid identification and management of sepsis

Knowledge of Vulnerabilities and Hazards regarding infections

«Failure to Rescue»

It is possible that a patient developing sepsis is identified too late and not treated according to standard procedures?
Tackling Antimicrobial Resistance – Antimicrobial Stewardship

Knowledge of Vulnerabilities and Hazards regarding infections

**Hazards:** resistance mechanism developed by micro-organism

**Vulnerabilities:** approach to antimicrobial prescription not compliant with standard procedures, lack of feedback and improvement on prescriptions, patients with immunodeficiencies, co-morbidities, shortage of drugs, not enough capacity of microbiology lab, lack of clinical approach

«Failure to Prevent»

*Is it possible that resistance mechanism are emerging as a consequence of not compliant prescription and fragmented IPC?*

«Failure to Treat»

*To what extent is possible that an empirical therapy may fail because a multidrug resistant bug was previously detected/suspected?*
Infection Management

- **RIMS**: Rapid identification and management of sepsis
- **AMS**: Antimicrobial Stewardship
- **IPCS**: Infection Prevention, Control, and Surveillance

- Knowledge of Vulnerabilities and Hazards regarding infections

Issues:
- Failure to Rescue
- Failure to Treat
- Failure to Prevent
Infection management

Knowledge of Vulnerabilities and Hazards regarding infections

Rapid identification and management of sepsis

Tackling Antimicrobial Resistance – Antimicrobial Stewardship

Infection Prevention Control and Surveillance

Monitoring and warning service

Dissemination and communication of Warning signs

Response capability

More Favourable Outcomes And Wellbeing
Developing Infrastructures

1. Research on prevention of infection hazards and vulnerabilities including an increased capability of early recognition of resistant bacteria (Clinical and Veterinary Microbiology) and compromised host response in humans (Clinical Chemistry Lab).

2. Continue in the promotion of integrated digital health and define requirement for inter-operable database.

In order to have efficient personalized medicine – fundamental in sepsis care – it is strategic to provide healthcare workers with aligned and usable system to detect and communicate warnings.

3. Promoting coherent coding strategies of sepsis in emergency care and hospital.

which requires a code for suspect of sepsis in emergency care (hospitalization for antimicrobial therapy with a suspect of organ dysfunction) interlinked with coding ICD in hospital and Clinical Services.

4. Supporting the implementation of national plans for Sepsis control and management.

To improve the early recognition, timeliness, and quality of diagnosis. The EU should also facilitate the exchange of best practices among national stakeholders, including the discussion within the European Council on Public Health.
Exchange of views

Adoption and implementation of national programmes: exchanging best practices

Juan Carlos Yebenes
Cataluña (Spain)
CODI SEPSIA
“Designing a territorial model for sepsis management in Catalonia”

Dr. Juan Carlos Yébenes
Servei de Medicina Intensiva
Hospital de Mataró
Grup de Treball en Sèpsia i Xoc Septic – SOCMIC
Comissió Assessora per la Atenció al Pacient amb Sèpsia - CatSalut
5. És possible atendre en format codi la sèpsia greu?

1. The syndrome is prevalent and presents a high morbi-mortality,
2. Treatment impact on morbimortality, is standardized and time-dependent
3. Some patients can require “special human or technical resources”
4. Delay on access to ICU impact on mortality in critically ill patients
Sepsis is an emergency code

- **2008**: Local experiences (unicentric sepsis codes)
- **2012**: SOCMIC Sepsis Working Group
- **2013**: DRAFT “SEPSIS CODE” (SOCMIC – SOCMUE)
- **2014**: CAAPAS (Advisory Committee for the Implementation of Sepsis CODE)

- **2015**: Parlament de Catalunya declared Sepsis as a Public Health Problem and require for the creation of sepsis code

*CatSalut. Instrucció 11/2015*
Codi sèpsia greu (CSG). Ordenació i configuració del model organitzatiu i dispositius per a l’atenció inicial a pacients amb sèpsia greu
**Sepsis management based on STEMI code?**

<table>
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<tr>
<th>Code STEMI</th>
<th>STEMI CODE</th>
<th>Sepsis Code</th>
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<tbody>
<tr>
<td>Chest Pain</td>
<td>Suspicion</td>
<td>Infection</td>
</tr>
<tr>
<td>ECG &lt; 10’</td>
<td>Assessment</td>
<td>Clinical evaluation &lt; 30’</td>
</tr>
<tr>
<td>ST Elevation</td>
<td>Inclusion Criteria</td>
<td>Organ failure (SOFA &gt;2) or hypoperfusion</td>
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<tr>
<td>Coronariography &lt; 2h</td>
<td>Objective</td>
<td>O₂, Volume, Culture, ATB &lt; 1h</td>
</tr>
<tr>
<td>UCO</td>
<td>Post procedure care</td>
<td>ICU</td>
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</table>

**STEMI CODE**
- Chest Pain
- ECG < 10’
- ST Elevation
- Coronariography < 2h
- UCO

**Sepsis Code**
- Infection
- Clinical evaluation < 30’
- Organ failure (SOFA >2) or hypoperfusion
- O₂, Volume, Culture, ATB < 1h
- ICU
**Detection**  
Setting: Universal

**Focus control and resuscitation**  
Setting: ED, Ward, ICU  
SEP-1 HOSP  
SEP-2 HOSP

**Organ specific support**  
Setting: ICU (SEP-2 HOSP)

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**A (Anamnesis)**  
Infectious Syndrome

**Evaluation of Systemic Impact**

- **B (Breathing):** RR, Sat a O₂,…
- **C (Circulation):** HR, BP, Skin,…
- **D (Neurological Deficit):** Coma, Meningism,…
- **E (Biomarkers Elevation):** Lactate, Acidosis,…

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**Sepsis**

- **T₀**
- **T <1h**
  - Culture and antibiotic
  - O₂ and 2L crystalloids

- **T <3h**
  - Monitoring and reassessment

- **T <6h**
  - Noradrenalin and/or ICU requirement evaluation

---

**Infection**

- ✔ No end of life scenario
- ✔ Successful source control?
- ✔ Initial hemodynamic resuscitation completed
- ✔ Organ Failure?

---

**ICU CHECK LIST**
5. Es posible atender en formato codi la sèpsia? 

Sepsis detection and initial management
Public Health System: equity on access, equity on results

Primary Care Hospital ("Comarcal"): 
- Hospital that provides clinical care and management on the prevalent diseases in the locality.
- Clinical services include general medicine, pediatrics, obstetrics and gynecology, surgery and anesthesia.
- Provides appropriate administrative and ancillary services (clinical laboratory, radiology, pharmacy).

Secondary Care Hospital ("General"): 
- Teaching and training hospital
- Provides specialized and particular forms of treatment, surgical procedure and intensive care.

Tertiary Care Hospital ("Terciari"): 
- Provides specialized and sub-specialized forms of treatments, surgical procedures and highly specialized critical care.

<table>
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<tr>
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<th>Secondary</th>
<th>Tertiary</th>
<th>Total</th>
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<tr>
<td>Alt Pirineu - Aran</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>28</strong></td>
<td><strong>14</strong></td>
<td><strong>9</strong></td>
<td><strong>51</strong></td>
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</table>
Primary Hospital are linked to secondary or tertiary hospitals forming a cluster to facilitate homogeneous criteria, derivation pathways, monitoring and feedback.

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<th>RS Girona</th>
<th>Hospital</th>
<th>Nivell adult</th>
<th>Nivell 1</th>
<th>Nivell 2a</th>
<th>Nivell 2b</th>
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<tr>
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<td>SEP-1</td>
<td>Hospital de Figueres</td>
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<td>Hospital Dr. Josep Trueta</td>
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Interhospital Sepsis Code in Catalonia (Spain): Territorial model for initial care of patients with sepsis

J.C. Yébenes\textsuperscript{a,*}, C. Lorenco\textsuperscript{b}, E. Esteban\textsuperscript{c}, L. Espinosa\textsuperscript{d}, J.M. Badia\textsuperscript{e}, J.A. Capdevila\textsuperscript{f}, B. Cisteró\textsuperscript{g}, S. Moreno\textsuperscript{h}, E. Calbo\textsuperscript{i}, X. Jiménez-Fabrégas\textsuperscript{j}, M. Cléries\textsuperscript{k}, M.T. Faixadas\textsuperscript{l}, R. Ferrer\textsuperscript{m}, E. Vela\textsuperscript{n}, C. Medina\textsuperscript{l}, A. Rodríguez\textsuperscript{n}, C. Netto\textsuperscript{g}, E. Armero\textsuperscript{o}, M. Solsona\textsuperscript{a}, R. Lopez\textsuperscript{d}, A. Granès\textsuperscript{j}, V. Pérez-Claveria\textsuperscript{o}, A. Artigas\textsuperscript{p}, J. Estany\textsuperscript{d} and Comisión Asesora para la Atención al Paciente con Sepsis y Grup de Treball de Sèpsis i Xoc Sèptic (GTSIX! SOCMIC-SOCMUE)

\textsuperscript{a} Servei de Medicina Intensiva, Hospital de Mataró, Mataró, Espanya
\textsuperscript{b} Servei de Medicina Intensiva, Hospital Universitari Dr. Josep Trueta, Girona, Espanya
\textsuperscript{c} Servei de Medicina Intensiva, Hospital Sant Joan de Déu, Barcelona, Espanya
\textsuperscript{d} Consorci Sanitari de Barcelona, CatSalut-Servei Català de la Salut, Barcelona, Espanya
\textsuperscript{e} Servei de Cirurgia General, Hospital Fundació Asil de Granollers, Granollers, Espanya
\textsuperscript{f} Servei de Medicina Intensiva, Hospital de Mataró, Mataró, Espanya
\textsuperscript{g} Servei d’Urgències, Corporació Sanitària Parc Taulí, Sabadell, Espanya
\textsuperscript{h} Area Bòsca de Salut Gràcia, Barcelona, Espanya
\textsuperscript{i} Servei de Medicina Interna-Malalties Infeccioses, Hospital Mutua de Terrassa, Terrassa, Espanya
\textsuperscript{j} Sistema d’Emergències Mèdiques (SEM)
\textsuperscript{k} Unitat d’Informació i Coneixement, CatSalut-Servei Català de la Salut, Barcelona, Espanya
\textsuperscript{l} Oficina Tècnica dels Registres de Codis d’Activació, CatSalut-Servei Català de la Salut, Barcelona, Espanya
\textsuperscript{m} Servei de Medicina Intensiva, Hospital Universitari Vall d’Hebron, Barcelona, Espanya
\textsuperscript{n} Servei de Medicina Intensiva, Hospital Universitari Joan XXIII, Tarragona, Espanya
\textsuperscript{o} Servei d’Urgències, Hospital Comarcal de Blanes, Blanes, Espanya
\textsuperscript{p} Servei de Medicina Intensiva, Corporació Sanitària Parc Taulí, Sabadell, Espanya
And now, how will we implement Codi Sèpsia?
Micro-learning & APP for prehospital detection

TRAINING

M-learning utility

Quality Accreditation on Sepsis

RSIXS

Advisory Committee implementation

SEPSIS

Sepsis Training and Feedback

FEEDBACK
Monitoring Key Process Indicators (KPI)
Compare to improve

RS Lleida
RS Tarragona
RS Terres de l’Ebre
RS Girona
RS Catalunya central
RS Alt Pirineu
AT Barcelona - Sud
AT Barcelona - Nord
Barcelona Nord i Baix Maresme
Maresme Central
H. de Mataró
Vallès Occidental Est
Vallès Occidental Oest
Baix Montseny
Baix Vallès
Vallès Oriental Central
AT Barcelona - Ciutat

ACISC
AT Barcelona - Nord - AGA Maresme Central
H. de Mataró

Evolució de la tasca del numerador
Evolució de la tasca del denominador
Evolució de l’indicador brut
Evolució de l’indicador quotit

Quality Accreditation on Sepsis

Sepsis prognosis “machine learning” analysis

SEPSIS DASHBOARD

 FEEDBACK
- Protocols for sepsis detection should be developed by all health care workers, from domiciliary and primary care to high technology hospitals.

- Septic patients who don’t respond to initial treatment should be evaluated to be placed on an ICU, independently if the hospital is a low complexity or a tertiary hospital.

- KPI as time to antibiotic administration or time to blood pressure normalization should be monitored.

- Feedback is essential to reevaluate and improve the strategy.
Thank you / Gràcies
jyebenes@csdm.cat
Exchange of views

Developing European sepsis guidelines: identification, diagnostics and treatment

Mercedes Bonet Semenas
World Health Organisation
Exchange of views

Developing European sepsis guidelines: identification, diagnostics and treatment

Maurizio Sanguinetti
European Society of Clinical Microbiology and Infectious Diseases (ESCMID)
The role of diagnostics in managing sepsis

Maurizio Sanguinetti
Institute of Microbiology
Fondazione Policlinico
Universitario “A. Gemelli” - IRCCS – Rome - Italy
Rapid diagnostic tests: the John Bartlett’s game changers in infectious diseases

• We concur with Dr. John Bartlett, retired infectious diseases physician, who stated in 2010 that rapid diagnostic tests are ‘game changing’ in the management of infectious diseases.

• However, in 2018, we concur with a modification of his statement as suggested by Bauer and Goff, that is: “Rapid diagnostic tests and antimicrobial stewardship economics will ‘change the game’ of managing patients with infectious diseases.”
AntiMicrobial and Diagnostic Stewardship: Minimum requirements for developing an institutional programme

Creation of a multidisciplinary inter-professional team which optimally should include but is not limited to:

• an infectious diseases (ID) physician
• a pharmacist with ID training
• a clinical microbiologist
• an infection control professional
• a hospital epidemiologist
AMS Programme

**ID specialist**
Assessing clinical signs & symptoms, diagnostic advice, antimicrobial drug selection, duration of treatment

**Clinical microbiologist**
Rapid diagnostic test delivery & interpretation, antimicrobial susceptibility testing, antimicrobial drug selection

**Hematologist/Intensivist**
Risk stratification, assessing clinical signs & symptoms, antimicrobial drug prescribing

**Hospital pharmacist**
Antimicrobial drug dosages, PK issues in specific patient populations, drug-drug interactions, TDM & interpretation

**Improved management of infections**
New diagnostic approaches in Clinical Microbiology playing a role in the antimicrobial therapy

- Mass-spectrometry identification of microorganisms (useful for sepsis or bacteremia, less useful for septic shock)
- Rapid susceptibility tests (phenotypic, microscopic or molecular)
- Use of biomarkers for the real-time management of therapies
- Real-time molecular methods able to efficiently detect microorganisms directly from clinical samples
The analysis suggests that the total cost of hospitalization was the decisive factor in determining the cost-effectiveness outcomes.

- The cost of hospitalization per day and the length of stay are the most influential variables in determining the cost-effectiveness results.
- Small decreases in the length of hospital stay result in large decreases in the total cost per patient.
- **An hypothetical new diagnostic test that considerably decreases the length of stay would be cost-effective even if the cost for the diagnostic test itself was high.**
The implementation of a rapid identification algorithm of blood cultures reduces the length of hospitalization

- The implementation of this integrated diagnostic algorithm leads to:
  - 5.5 days reduction in hospital stay;
  - 4.2 days reduction in therapy length;
  - 20% increase of optimal therapy at the start of antibiotic treatment.

Fiori et al., JCM, 2017

Murri et al., Diag. Microbiol. Infect. Dis., 2018
The bloodstream infection time to diagnosis affects therapy length

Time to de-escalation off antipseudomonal beta-lactams in patients with bloodstream infection due to *Enterobacteriaceae*.

Bookstaver et al., AAC, 2017
T2Dx: Rapid Identification of Sepsis-Causing Pathogens

- As low as 1 CFU/mL LoD
- Easy to operate
- Minimal hands-on time
- Results in hours

T2Bacteria
- Sensitivity: 95.8%
- Specificity: 98.1%
- Enterococcus faecium
- Staphylococcus aureus
- Klebsiella pneumoniae
- Acinetobacter baumannii
- Pseudomonas aeruginosa
- Escherichia coli

T2Candida
- Sensitivity: 91.1%
- Specificity: 99.4%
- Candida albicans
- Candida tropicalis
- Candida krusei
- Candida glabrata
- Candida parapsilosis

1. T2Bacteria Pivotal Clinical Study.
**T2Dx Candida panel**

- T2MR demonstrated an overall specificity per assay of 99.4% with a mean time to negative result of 4.2 ± 0.9 hours. The overall sensitivity was found to be 91.1% (96.6% considering also other studies) with a mean time of 4.4 ± 1.0 hours for detection and species identification\(^1\),\(^2\)

- Significant reduction of the time to appropriate therapy (from 20 to 28 hours)\(^3\),\(^4\)
- Significant reduction of the time to detection of *Candida*\(^3\)
- Significant reduction of the ICU length of stay\(^3\)
- Significant reduction in antifungal consumption\(^4\)
- Strong indicator of complications and poor outcomes\(^5\)

---

1. Mylonakis E, et al. CID, 2018  
2. Clancy C, et al. CID, 2018  
4. Patch et al., CMI, 2018  
5. Munoz et al., CMI, 2018
Why the 24-hour laboratory is an important value in the Hospital

• To provide in real-time results to the clinicians to reduce mortality
• To enhance the efficacy of the obtained results that otherwise would be un-useful if the tests are used few times during the week
• To permit a continuous adjustment of the treatment on the basis of the obtained results and to reduce the empirical therapy
The 24-h clinical microbiology service is essential for patient management

Joseph M Blondeau*1,2 & Evgeny A Idelevich3
1Department of Clinical Microbiology, Royal University Hospital & Saskatchewan Health Authority; Saskatoon, Saskatchewan, Canada
2Departments of Microbiology & Immunology, Pathology & Ophthalmology, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
3Institute of Medical Microbiology, University Hospital Münster, Münster, Germany
*Author for correspondence: Tel.: +1 306 655 6943; Fax: +1 306 655 6947; joseph.blondeau@saskhealthauthority.ca

“optimal patient care requires access to necessary laboratory testing including clinical microbiology. A rethinking of hours of operation is required to shorten time to accurate result reporting.”

First draft submitted: 14 August 2018; Accepted for publication: 15 October 2018; Published online: 14 November 2018

Future Microbiol. (Epub ahead of print)
Can point-of-care testing shorten hospitalization length of stay?
An exploratory investigation of infectious agents using regression modelling

Eliona Gkika, Anna Psaroulaki and Yannis Tsalentis
University of Crete, Greece

Emmanouil Angelakis
Aix Marseille Université, France

Vassilis S Kouikoglou
Technical University of Crete, Greece

• This retrospective study investigates the potential benefits from the introduction of point-of-care tests for rapid diagnosis of infectious diseases.

• The authors analysed a sample of 441 hospitalized patients who had received a final diagnosis related to 18 pathogenic agents.

• The length of hospital stay was partitioned into pre- and post-laboratory diagnosis stages.

• Regression analysis and elementary queueing theory were applied to estimate the impact of quick diagnosis on the mean length of stay and the utilization of healthcare resources.

• The analysis suggests that eliminating the pre-diagnosis times through point-of-care testing could shorten the mean length of hospital stay for infectious diseases by up to 34 per cent and result in an equal reduction in bed occupancy and other resources.
Exchange of views

Developing European sepsis guidelines: identification, diagnostics and treatment

Maria Martinez
Vall d’Hebron University Hospital (Spain)
Time to decision in Sepsis

Survival chain in sepsis: identifying barriers from admission to treatment

María Martínez
Intensive Care. Vall d’Hebron University Hospital.
Barcelona, Spain.
Structure

- Background
- Objectives
- Methods
- Results
- Conclusions
Global improvement in sepsis treatment:
• Screening tools.
• Initial treatment bundles.
• Rapid identification tools.

Assistential process → Lower mortality\(^1\)
Training

Improves results\(^2,3\)

Background

Sepsis is a time-dependent disease

There is no information on the assistential process. We aim to identify barriers to the process, from the diagnosis to the final treatment decision.
Objectives

**Primary:** to describe the assistential process of sepsis in Spanish hospitals.

**Secondaries:**

- **Initial care:**
  - To describe the diagnostic strategies in the Emergency Department.
  - To evaluate the prevalence of Code Sepsis.
  - To describe the initial microbiological sampling.
  - To evaluate the prevalence of antibiotic protocols.

- **Microbiological diagnosis.**
  - To identify the differences in sample processing.
  - To evaluate the use of conventional vs. molecular techniques.
  - To identify communication between the clinician and the microbiologist.

- **Definitive antibiotic treatment:**
  - To identify the factors that lead to modify an empiric treatment.
  - To identify the factors that modify the duration of treatment.

We describe how we work...

...to analyse how to improve.
Methods

• Four online surveys.
• Directed to professionals involved in sepsis care at any level.
• Distributed through scientific societies:
  • SEMICYUC (Spanish Intensive Care Society).
  • SEIMC (Spanish Infectious Diseases and Clinical Microbiology Society).
  • SEMES (Spanish Emergency Medicine Society).
• Descriptive analysis with SPSS.

Through our surveys we draw a picture of sepsis care in Spain.
Distribution of the surveys
Methods

Clinical Suspicion
- Cultures
- Biomarkers

Empirical treatment
- Rapid diagnostic tests
- Culture
- Antibiogram
- Expert consultation
- Lab-ICU communication

Definitive treatment
- Adequate Source Control
- Clinical evolution
- Dose and Interval

End of treatment

Broad spectrum
Targeted
Results

697 responses

Emergency department: 396
Clinical Microbiology: 112
Infectious diseases: 92
Intensive Care: 97
## Results: general

<table>
<thead>
<tr>
<th>Emergency Department</th>
<th>Clinical Microbiology</th>
<th>Infectious Diseases</th>
<th>Intensive Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Public</td>
<td>333</td>
<td>84,7</td>
<td>106</td>
</tr>
<tr>
<td>University</td>
<td>275</td>
<td>70,5</td>
<td>101</td>
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### Number of beds

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>&lt;300</td>
<td>139</td>
<td>35,4</td>
</tr>
<tr>
<td>300-500</td>
<td>107</td>
<td>27,2</td>
</tr>
<tr>
<td>500-1000</td>
<td>79</td>
<td>20,1</td>
</tr>
<tr>
<td>&gt;1000</td>
<td>27</td>
<td>6,9</td>
</tr>
<tr>
<td>DK</td>
<td>41</td>
<td>9,8</td>
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</table>

### Complexity

<table>
<thead>
<tr>
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<tr>
<td>Primary</td>
<td>82</td>
<td>20,9</td>
</tr>
<tr>
<td>Secondary</td>
<td>149</td>
<td>38,0</td>
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<tr>
<td>Tertiary</td>
<td>161</td>
<td>41,1</td>
</tr>
</tbody>
</table>

---

*Vall d’Hebron*

Barcelona Campus Hospitalari
Results: laboratory availability

<table>
<thead>
<tr>
<th></th>
<th>Emergency Department</th>
<th>Clinical Microbiology</th>
<th>Infectious Diseases</th>
<th>Intensive Care</th>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24/7</td>
<td>349</td>
<td>88,8</td>
<td>116</td>
<td>94,3</td>
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<tr>
<td>Working</td>
<td>33</td>
<td>8,4</td>
<td>6</td>
<td>4,9</td>
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<tr>
<td>External</td>
<td>11</td>
<td>2,8</td>
<td>1</td>
<td>0,8</td>
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<tr>
<td><strong>Microbiology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24/7</td>
<td>226</td>
<td>57,7</td>
<td>73</td>
<td>59,4</td>
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<tr>
<td>Working</td>
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<td>49</td>
<td>39,8</td>
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<tr>
<td>External</td>
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<td>0,8</td>
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Results: Sepsis detection

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<td><strong>N</strong></td>
<td><strong>%</strong></td>
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<tr>
<td>Structured triage</td>
<td>339</td>
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<tr>
<td>Sepsis screening</td>
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<tr>
<td>qSOFA</td>
<td>298</td>
</tr>
<tr>
<td>NEWS</td>
<td>10</td>
</tr>
<tr>
<td>SIRS</td>
<td>71</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>None</td>
<td>9</td>
</tr>
<tr>
<td>Sepsis confirmation</td>
<td></td>
</tr>
<tr>
<td>SIRS+Infection</td>
<td>213</td>
</tr>
<tr>
<td>≥2 SOFA points</td>
<td>171</td>
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<tr>
<td>Other</td>
<td>7</td>
</tr>
<tr>
<td>Biomarkers</td>
<td></td>
</tr>
<tr>
<td>PCR</td>
<td>83</td>
</tr>
<tr>
<td>PCT</td>
<td>146</td>
</tr>
<tr>
<td>Lactate</td>
<td>119</td>
</tr>
<tr>
<td>Any combination</td>
<td>40</td>
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<tr>
<td>None</td>
<td>8</td>
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Results: Code Sepsis

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<tr>
<td><strong>N</strong></td>
<td><strong>%</strong></td>
</tr>
<tr>
<td>Code Sepsis</td>
<td>277</td>
</tr>
<tr>
<td><strong>Activation</strong></td>
<td></td>
</tr>
<tr>
<td>Automatic</td>
<td>40</td>
</tr>
<tr>
<td>Nurse</td>
<td>128</td>
</tr>
<tr>
<td>Physician</td>
<td>142</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
</tr>
<tr>
<td><strong>Activation bundles</strong></td>
<td></td>
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<tr>
<td>ICU alert</td>
<td>29</td>
</tr>
<tr>
<td>Cultures</td>
<td>11</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>16</td>
</tr>
<tr>
<td>Fluid resuscitation</td>
<td>4</td>
</tr>
<tr>
<td>All</td>
<td>203</td>
</tr>
<tr>
<td>Some</td>
<td>64</td>
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<tr>
<td>Other</td>
<td>2</td>
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</table>
Results: blood cultures

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<th>Infectious Diseases</th>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Immediate extraction</td>
<td>334</td>
<td>84,3</td>
<td>-</td>
</tr>
<tr>
<td>Protocolised</td>
<td>290</td>
<td>73,2</td>
<td>-</td>
</tr>
<tr>
<td>By nurse</td>
<td>290</td>
<td>73,2</td>
<td>-</td>
</tr>
<tr>
<td>Serial</td>
<td>275</td>
<td>69,6</td>
<td>-</td>
</tr>
<tr>
<td>2 sets</td>
<td>-</td>
<td>-</td>
<td>111</td>
</tr>
<tr>
<td>Immediate sending</td>
<td>310</td>
<td>76,7</td>
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<tr>
<td>CS priority</td>
<td></td>
<td></td>
<td>47</td>
</tr>
<tr>
<td>Time to lab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ 1-2h</td>
<td>-</td>
<td>-</td>
<td>66</td>
</tr>
<tr>
<td>□ 3-7h</td>
<td>-</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td>□ &gt;7h</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>□ DK</td>
<td>-</td>
<td>-</td>
<td>29</td>
</tr>
<tr>
<td>Contamination</td>
<td></td>
<td></td>
<td>Median [25-75]</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>7%</td>
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</table>
Results: culture processing

<table>
<thead>
<tr>
<th>Clinical Microbiology</th>
<th>N</th>
<th>%</th>
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<tbody>
<tr>
<td>Rapid identification techniques</td>
<td>23</td>
<td>18.9</td>
</tr>
<tr>
<td>Bacterial identification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Commercial tests</td>
<td>27</td>
<td>22.0</td>
</tr>
<tr>
<td>MALDI-TOF culture</td>
<td>77</td>
<td>62.6</td>
</tr>
<tr>
<td>MALDI-TOF colony</td>
<td>9</td>
<td>7.3</td>
</tr>
<tr>
<td>Molecular techniques</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Other</td>
<td>10</td>
<td>8.1</td>
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<tr>
<td>Antibiogram technique</td>
<td></td>
<td></td>
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<tr>
<td>Rapid (EUCAST)</td>
<td>26</td>
<td>21.1</td>
</tr>
<tr>
<td>Commercial rapid test</td>
<td>5</td>
<td>4.0</td>
</tr>
<tr>
<td>Direct (culture)</td>
<td>66</td>
<td>53.7</td>
</tr>
<tr>
<td>Colony</td>
<td>26</td>
<td>21.1</td>
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Results: empiric prescription

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<th>Antibiotic protocol</th>
<th>Emergency Department</th>
<th>Infectious Diseases</th>
<th>Intensive Care</th>
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<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Antibiotic protocol</td>
<td>293</td>
<td>74,2</td>
<td>71</td>
</tr>
<tr>
<td>Limit to prescription</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ No limit</td>
<td>262</td>
<td>67,0</td>
<td>-</td>
</tr>
<tr>
<td>□ Stock in ED</td>
<td>50</td>
<td>12,8</td>
<td>-</td>
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<tr>
<td>□ Pharmacy</td>
<td>65</td>
<td>16,6</td>
<td>-</td>
</tr>
<tr>
<td>□ ID consult</td>
<td>3</td>
<td>0,8</td>
<td>-</td>
</tr>
<tr>
<td>□ Other</td>
<td>11</td>
<td>2,8</td>
<td>-</td>
</tr>
</tbody>
</table>
Results: communication

<table>
<thead>
<tr>
<th>Notification</th>
<th>Clinical Microbiology</th>
<th>Infectious Diseases</th>
<th>Intensive Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ CMS- preliminary</td>
<td>11  8,9</td>
<td>13     14,1</td>
<td>17  17,5</td>
</tr>
<tr>
<td>□ CMS- only definitive</td>
<td>0        0</td>
<td>0             0</td>
<td>6    6,2</td>
</tr>
<tr>
<td>□ Rapid - informal</td>
<td>105    85,4</td>
<td>66     71,7</td>
<td>71  73,2</td>
</tr>
<tr>
<td>□ Other</td>
<td>7     5,7</td>
<td>13     9</td>
<td>3    3,1</td>
</tr>
<tr>
<td>Time to definitive 48-72h</td>
<td>-      -</td>
<td>74     77,9</td>
<td>70  72,2</td>
</tr>
</tbody>
</table>

N % N % N %

- CMS: Clinical Microbiology
- Infectious Diseases
- Intensive Care

Time to definitive 48-72h
Results: modification of treatment

<table>
<thead>
<tr>
<th></th>
<th>Infectious Diseases</th>
<th>Intensive Care</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Preliminary results</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Definitive results</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Escalate treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Clinical deterioration</td>
<td>81</td>
<td>87.1</td>
</tr>
<tr>
<td>- Analytical deterioration</td>
<td>9</td>
<td>9.7</td>
</tr>
<tr>
<td>- Microbiology results</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>De-escalate treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Microbiology results</td>
<td>24</td>
<td>26.1</td>
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<tr>
<td>- Clinical improvement</td>
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<td>21.7</td>
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<tr>
<td>- Expert team consultation</td>
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<tr>
<td>- Never</td>
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Results: ICU

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<tr>
<th>Infectious disease expert</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, intensivist, part of the staff</td>
<td>73</td>
<td>76.8</td>
</tr>
<tr>
<td>Yes, external</td>
<td>10</td>
<td>10.5</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>12.6</td>
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</tbody>
</table>
Results: registry of quality indicators

<table>
<thead>
<tr>
<th></th>
<th>Emergency Department</th>
<th>Clinical Microbiology</th>
<th>Infectious Diseases</th>
<th>Intensive Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Yes</td>
<td>178</td>
<td>44,9</td>
<td>13</td>
<td>10,6</td>
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<tr>
<td>No</td>
<td>132</td>
<td>33,3</td>
<td>79</td>
<td>64,2</td>
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<tr>
<td>DK</td>
<td>178</td>
<td>45</td>
<td>31</td>
<td>25,2</td>
</tr>
</tbody>
</table>
Conclusions

There is:

• Low penetrance of SOFA. qSOFA however turned into a popular screening tool.
• No Code Sepsis in up to 36% of the surveyed hospitals. Incomplete activation bundles.
• No rapid diagnosis microbiology techniques.
• No empiric antibiotic protocol in up to 30% of surveyed hospitals.
• No trust in preliminary results.
• No official swift communication pathways.
• No registry of quality indicators

There is room for optimisation
Conclusions: potential improvements

Screening tools
- Code Sepsis
- Cultures
- Biomarkers

Rapid diagnostic tests
- Microbiologist 24/7
- Culture
- Antibiogram
- Expert consultation
- Lab-ICU communication

Adequate Source Control
- Clinical evolution
- Dose and Interval

Quality indicators

Clinical Suspicion
Empirical treatment
Definitive treatment
End of treatment

Broad spectrum
Targeted

Treatment protocols
Thank you

maria.martinez@vhir.org
Exchange of views

Developing European sepsis guidelines: identification, diagnostics and treatment

Robert Leach
European Society for Emergency Medicine
ΣΗΨΗ
DATA
Exchange of views

European awareness campaign: moving forward

Marvin Zick
Global Sepsis Alliance
European Awareness Campaign: Moving Forward

Marvin Zick
Global Sepsis Alliance
September 25th, 2019
AWARENESS IS THE GREATEST AGENT FOR CHANGE.

- Eckhart Tolle -
Prevent Sepsis – By Shee Awareness

- About 30 million cases worldwide, about 7 to 9 million deaths
- One death every 3.5 seconds
- Most preventable cause of death worldwide
- Protocols, QI, action plans all hugely helpful
Awareness & Advocacy
Introducing the Global Sepsis Alliance
Introducing the Global Sepsis Alliance

• Non-profit charity organization

• Founded in 2010 by a coalition of medical societies

• Over 96 member organizations worldwide, more than 5,000 hospitals, people affected by sepsis, national and international health authorities

• 6 regional sepsis alliances, incl. European Sepsis Alliance
WHA Resolution on Sepsis

• On May 26th, 2017, the World Health Assembly adopted a resolution on sepsis

• This resolution is a quantum leap in the fight against sepsis and will save countless lives around the world
Social Media

World Sepsis Day
Published by Martin Zick (9), November 13, 2018.

Today is #WorldPneumoniaDay - do you know that pneumonia is one of the most common causes for sepsis? Get vaccinated!
#VaccinesWork #1stopsepsis #saveLives.

World Sepsis Day Infographics

SOURCES OF SEPSIS

The Most Common Sources of Sepsis

- Meningitis
- Bloodstream infection
- Pneumonia
- Abdominal infections, e.g. appendicitis, infectious cholecystitis, or cholecystitis
- Catheter-related infection
- Urinary tract infection

www.world-sepsis-day.org
www.global-sepsis-alliance.org

91,312 People Reached
6,239 Engagements

Show your support on Social Media.

Global Sepsis Alliance

#1stopsepsis #saveLives

One Day - One Voice - All Your Effort September 13

www.world-sepsis-day.org

Social Media
World Sepsis Congress: Bringing Knowledge About Sepsis To All Parts of the World

- Series of free online congresses
  - 1st WSC in 2016
  - WSC Spotlight in 2017 with WHO
  - 2nd WSC in 2018
  - 3rd WSC in 2020
Digital Resources
Introducing the Global Sepsis Alliance
Takeaway

1. **Awareness** of sepsis saves lives

2. Changing how sepsis is measured, diagnosed, and treated all around the world means **involving everybody**

3. **Involving everybody** starts with **awareness**
A World Free of Sepsis!

www.global-sepsis-alliance.org
www.worldsepsisday.org
www.worldsepsiscongress.org
www.wscspotlight.org
Open debate

Moderated by Brian Maguire
Closing remarks
Thank you!

Roundtable Debate - 25 September 2019