COVID-19: THE PERSPECTIVES OF CLINICAL ENGINEERS ACROSS EUROPE

INTRODUCTION
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WEBINAR COVID-19
- WED -
29 APRIL
2020

WEBINAR COVID-19
17:00 - 18:30 CET

IN COLLABORATION WITH:
IPEM
SEEIC

Wednesday, April 29 2020
SEEIC - SPAIN

Raquel Canovas Paradell
Covid-19 spanish experience

Raquel Cánovas
• Deputy Tecnology Director
  University Hospital Vall d’Hebron

• Seeic – Board Member
  International Department
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Spain

232,132 confirmed cases

23,660 death

123,903 recovered

29/04/2020 data
Spain by communities

13 April – lock down
Community incidence

Madrid
Diagnosticados: 59784
Activos: 15895
Recuperados: 35841
Muertos: 8048
897,20 casos y 120,78 muertes por cada 100.000 habitantes.

Cataluña*
Diagnosticados: 48158
Activos: 30031
Recuperados: 13319
Muertos: 4808
627,45 casos y 62,64 muertes por cada 100.000 habitantes.

País Vasco
Diagnosticados: 12564
Activos: 1335
Recuperados: 9974
Muertos: 1255
569,08 casos y 56,84 muertes por cada 100.000 habitantes

Navarra
Diagnosticados: 4759
Activos: 2349
Recuperados: 1978
Muertos: 432
727,44 casos y 66,03 muertes por cada 100.000 habitantes.
Main challenges and criticalities you had regarding technology in the Covid-19 outbreak
Main challenges and criticalities you had regarding technology in the Covid-19 outbreak

• Political chaos at all levels
• Hospital alone
• Solutions had to be at local level
• No information of patient income behavior
• No additional equipment arrived
• Single pathology - Covid Hospital
Lessons learned and best practices
Lessons learned and best practices

Best practices

• Covid Hospital transformation – Elastic Hospital
• Medical Devices Stock – old ICU ventilator is better than none
• Professionals Training – Adaptation capacity
• Pavilions and Hotels for Hospitalized patients
• Technicians network and collaboration (whatapp)
• Centralized repair
• 3D Spare parts

Good intentions poor results

• Others ventilators (anesthesia, NVI, CPAP, etc.)
• Two patients one ventilator
• Centralized purchase and distribution
• “New Ventilators”
Hospital reaction - HU Vall d’Hebron

Increase of capacity ICU

Open 100 ICU bed in 7 days (50+ready)
600 hospitalization beds covid
Hospital reaction – Critical patients

Increase of capacity ICU -138 box + 48 box ready

ICU Expansion - 13 Areas - 3 Different Buildings
• Natural Areas (i.e. Post-Surgical Rea)
• New Wide Efficient Spaces
Hospital reaction – Hospitalization

Hotels and Sport pavilions - Hospital extension

Hospital wards transformed to covid
- Review circuits – Transport - Accesses
- High Storage required

Covid and non-Covid areas for HCW at hotels

Non-severe Pneumonia Patients
Stock-up is crucial
The new old ICU ventilator is better than no ventilator

Anesthesia, transport, research, NIV are no use for long-term complex patients
3D parts - provision
Stock-up is crucial 218 ventilation units required only 40 arrived and at the end of crisis

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Units</th>
<th>New Covid</th>
<th>Old/ Moved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilator IC</td>
<td>218</td>
<td>40</td>
<td>178</td>
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<tr>
<td>Antestesia</td>
<td>94</td>
<td>94</td>
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<tr>
<td>Basic ventilators (CPAP,Bipap, NIV)</td>
<td>49</td>
<td>49</td>
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<tr>
<td>High Flow ventilation</td>
<td>52</td>
<td>52</td>
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<tr>
<td>Transport Ventilation</td>
<td>54</td>
<td>8</td>
<td>46</td>
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<tr>
<td>Monitor Ic</td>
<td>109</td>
<td>40</td>
<td>69</td>
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<td>Moduls especific</td>
<td>16</td>
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<tr>
<td>Monitor compact</td>
<td>60</td>
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<tr>
<td>Monitor compact (mini)</td>
<td>67</td>
<td>12</td>
<td>55</td>
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<td>Pulsioximetry</td>
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<tr>
<td>Infusio Pumps</td>
<td>587</td>
<td>500</td>
<td>87</td>
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<tr>
<td>Flow/Vacum meters</td>
<td>740</td>
<td>286</td>
<td>454</td>
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<tr>
<td>ECMO</td>
<td>4</td>
<td>2</td>
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<tr>
<td>ECG</td>
<td>11</td>
<td>11</td>
<td></td>
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<tr>
<td>Defibrilator</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Total general</td>
<td>2.156</td>
<td>888</td>
<td>1.268</td>
</tr>
</tbody>
</table>
Training for Dr and Nurses
Future directions given this experience (for your country and especially for Europe as a whole)
Future directions given this experience – Elastic Response

- **Hospitals** – **Elastic Hospital** - Critical and Non Critical patient’s capacity increase
  - Flexible Architecture– Open ICU - DOUBLE USE (Gym-Training- Day Care –Out patient...)
  - Medical Devices back-up Storage

- **Industry:**
  - **Strategic local stock** – end of just in time
  - **Promote local industry**
  - Promote alliances between industries (car industries and others...)
  - Contingency plans (basic use of devices – alternative use instructions – homologation of disposables for all manufactures – emergency resterilization...)
  - Training and technical manuals (EU Directive -for medical devices)

- **Clinical Engineer:** **New opportunity to stand up**
Elastic Hospital
New Wide Efficient Spaces
BE PREPARED – DOUBLE USE AREAS

Training - Simulation – DayCare – Outpatient open areas - Gym

• All patients same pathology
• Doctors and Nurses - efficient work – lower rate per patient
• Centralized monitoring
• Homologation of equipment
• Architecture
  • Circuits
  • Resting areas
  • Storage areas
• Infrastructure
  • Medical gas – electric - AC
Bill Gates:
2015... Not missiles but microbes

April 2020.... This time we will be ready for next epidemic
“Patient always first”
AFIB - France

Christophe Parret
COVID-19:
THE PERSPECTIVES OF
CLINICAL ENGINEERS
ACROSS EUROPE

Christophe PARRET, AFIB France
Summary

1. Main challenges and criticalities your country had regarding technology in the Covid-19 outbreak

2. Main lessons learned and best practices

3. What do you suggest as future directions given this experience (for your country and especially for Europe as a whole)
Main challenges and criticalities

**Challenges:**

**Increase in resuscitation bed capacity**
- The challenge in France to go from 5400 resuscitation beds to 10000 beds
- There are 3 kinds of beds in France:
  - *Resuscitation* where the patient is ventilated and the number of staff is standardized.
  - *Intensive Care* and *Continuous Care Units* where the patient is not ventilated and the number of staff is higher than a conventional bed.

**Converting our organisation to the crisis**
- Reorganization of the structures (*Surgery room closed*, transformation of the recovery room into ICU and ICU into resuscitation)
- Definition of the needs of a typical bed in France (CHU of grenoble)
  - 1 Monitor (ECP, NIPB, saO2, etcO2,T°), Infusion 7 syringe pumps, 1 Ventilator
  - Ex : Grenoble University Hospital from 40 beds to 90 beds (50 ventilators and 350 syringe pumps...)
Main challenges and criticalities

Challenges:

Support of associated consumables
• as well as reagents for automated laboratory equipment.
• Consumables were quickly out of stock and replacement references had to be found, which required technical skills.

Networking
• With our own team technical people
• with resuscitators, pharmacists and other logistics services

Clinical Engineer key player
• Define and find the equipment (ventilators, infusion, humidification…and PCR equipment)
Main challenges and criticalities

Criticalities:

The reduced number of manufacturers
• Hospital budgets in France are increasingly constrained. In recent years, a purchasing performance policy has been put in place, with centralised purchasing. In the current crisis, this has accelerated the shortage of equipment and consumables. French hospitals work with one or even two companies for many items of equipment.

Consumables and reagents
• There was little stock on associated consumables (respirator patient circuit, NIV mask, rapidly missing valve, laboratory reagents...). The Biomedical helped to find substitute references.

Concertation of the different actors
• In France there has been little concertation at local, regional and national level
• Many people made the same requests to the same company => taken in hand at national level for necessary arbitration.
Main lessons learned and best practices

Review our purchasing policy Single Use versus reusable
• Review the consumables purchasing policy and ask the question of all SU
• SU vs Reusable - Can be good for the planet too?

Importance of biomedical expertise to buyers
• Knowledge of the type of equipment for a defined requirement. It is necessary to be precise in the request...

Level of coordination region, France, Europe
• Little national consultation and therefore little European exchange
  – Difficulties learning from the experiences of others ...

Management of Technology Initiatives
• What can we learn from it? True and false solutions, a huge collective and creative effort,
  – Apart from the crisis, to produce in large quantities low cost equipment for Europe and LMICs in connection with WHO from the Boussignac valve to the Makair project.
  – Initiative of the French compagnies with the Makair project very advanced - All in Open source - Turbine ventilator at very low cost. Can it be a European solution? or a worldwide solution? https://github.com/makers-for-life/makair
suggest as future directions

Rethinking our purchasing techniques in France
• Avoid single suppliers on one type of equipment, work on the number of equipment
• be able to manufacture adapted equipment in record time.

Better coordination in France and Europe
• In France better coordination at local, regional and national level (many individual initiatives)
• The federation should enable us to work together regularly and to better respond to this crisis type.

Work on a European independence
• Work on a European independence on critical equipment (respirators and associated consumables...analyzers and reagents)

To enhance the value of our profession in this type of crisis at national and European level.
FMBT - Germany

Frank Rothe
Health Technology Management in times of Covid-19

Frank Rothe
frank.rothe@vamed.com
Situation in Germany, 28th of April 2020

⇒ No general health system collapse so far.
⇒ Overburden only in certain areas and hospitals
⇒ Germany supports other countries by lending equipment and medical staff and bringing seriously ill patients to Germany.

Health System Figures

- Hospitals ~ 1,950
- Clinic beds ~ 500,000
- ICU beds (before COVID-19) ~ 28,000
- ICU beds (actual - still increasing) ~ 33,000

ICU beds per 100,000 inhabitants

- Deutschland (2017): 33,9
- Österreich (2018): 28,9
- USA (2018): 25,8
- Frankreich (2018): 16,3
- Spanien (2017): 9,7
- Italien (2020): 8,6
- Dänemark (2014): 7,8
- Irland (2016): 5,0

Quelle: OECD, stern, Statista
Covid 19 – Major actions taken by hospitals in Germany

- Initiation of interdisciplinary COVID 19 emergency task forces reporting directly to the CEO/ C-Suite
- Nominating one responsible COVID-19 agent where all concerns can be placed
- Implementation of periodical communication in newsgroups and information boards
- Set hospital to crisis mode, e.g. postponing all elective treatments
- Create separate drop-in-center's for COVID 19 suspicious patients
- Set up additional trainings to prepare staff to work in ICUs
- Keep out all persons, that are not necessarily needed from high-risk-patient areas (e.g. skipping preventive maintenance actions in ICUs)
- Verify again and raise hygienic standards
- Active daily monitoring and central reporting of ICU capacities
- Increase logistic capacities to shift patients and materials quickly
- Regular testing of staff treating COVID 19 patients
- Special working schedules to avoid larger loss of staff
- Increasing stock for personal protective equipment and medical devices and accessory needed to treat COVID 19 patients (if available, of course)

Recent developments:
- In metropolitan regions special corona treatment center`s are set up
- Hospitals reopen to elective treatments
Covid 19 – Major Tasks of HTM Departments

- Participating in and supporting the interdisciplinary COVID 19 task forces in hospitals
- Refurbish already ascertained and check ventilation related medical devices and put them back / maintain them in good working condition (esp. ventilators, anesthesia machines, ECMOs, patient monitors, pulse oximeters, infusion pumps and blood gas analyzers.
- Implementing a system of pooling and monitoring if the mentioned devices are in use and pre-organise logistics to get them as quickly as possible to where they are needed most
- Assist the procurement department to plan (and buy) required accessory
- Separate doubtful offers/suppliers of devices and accessory from serious ones
- Support Sterilization Team to figure out possibilities to decontaminate/ resterilize single use accessories
- Adjust stock spare parts or similar to possible shortages
- Initiating additional technical training for hospital staff to prepare them for ICU work
- Handling troubles caused by general lockdown
- Keep service suppliers on track
- Refresh HTM-staff trainings when and how to use PPE
- Following the website of IFBME (https://ced.ifmbe.org/blog/covid19-resources.html)
- Subscribing the IFMBE „hacking COVID 19 service“
UPEM – United Kingdom

Emmanuel Akinluyi
1

CONTEXT & CHALLENGES

Dr Didi (Emmanuel) Akinluyi
Emmanuel.Akinluyi@gstt.nhs.uk
First cases in the UK

The prime minister announces a nationwide lockdown

PM himself discharged from care.

COVID19 mortality in decline, but measures will remain in place “for at least the next three weeks”
THE UK’S JOURNEY IN HEADLINES

January 31
First cases in the UK

March 23
The prime minister announces a nationwide lockdown

April 12
PM himself discharged from care.

April 16
COVID19 mortality in decline, but measures will remain in place “for at least the next three weeks”.

https://www.worldometers.info/coronavirus/country/uk/
HOW ARE WE ORGANISED?

- Devolved Nations
  - Chief Scientific Offices

- NHS England CSO Office

- Regional HCS Coordinators

- English Regional
  - CE leads
  - Clinical engineering leads
  - COVID group

- Devolved Administrations
  - Clinical Engineering leads

- England Regional Clinical Engineering networks
  - Lon, SW, SE, Mid, EoE, NW, NE/York

- DN HCS/CE networks
  - Wales, N Ireland, Scotland

Hospital Clinical Engineering Departments

COVID Community of Interest (IPEM)

Key:
- Advice
- Information
- Organisational
- Professional space

Courtesy of Keith Ison.
With permission
Version: 19/4/20
The clinical reality

National organisation Of HTM

Regional organisation Of HTM

Local (hospital) organisation Of HTM

Scale of decisions, downstream impact

Actual Clinical Engineering involvement
‘COMMAND & CONTROL’ PROCUREMENT

Centralised procurement, allocation and distribution as loans.

**Advantages:**
- Potential for system-level thinking, rather than local market forces determining outcomes.
- Economy of scale

**Challenges:**
- Establish **new supply chain**
  - Mitigate disruption of normal supply-chain.
  - Endure delays in procurement.
- Capture **requirements**, model need.
  - Account for variation in need over time and locality.
  - Account for ‘preference’ (local familiarity/standardisation/infrastructure)
- Deal with the **consequences** of pressured procurement driven by availability, rather than need
The allocation process that is more centred on local need and has been developed with the support of CEs working in advisory capacities.
‘ESCALATION & LOAN’ PROTOCOL

The allocation process that is more centred on local need and has been developed with the support of CEs working in advisory capacities.

Advantages:
In theory enables the right information to flow

Challenges:
In practice, requires robust support to gather and escalate the right information.

Needs CE input and leadership
MAIN CHALLENGES

Getting the right equipment to the right place, at the right time in the right condition.

Right equipment
- Securing supply
- The need for needs analysis
- Technical due diligence – evaluating novel solutions.

Right place and time
- Reporting, forecasting
- Mobilising our capability

Right condition
- Reinforcing our workforce to deliver.

To do this, we need to engage and lead. The challenge in this is getting Clinical Engineers into positions to show leadership.
INITIATIVES & LESSONS
ASSEMBLING INTO (SUB)TEAMS

Coordinating team efforts on local, regional and national levels.

• **Identify** roles and nominated groups early on.
• **Organise**, to avoid duplication.
• **Empower** teams and volunteers to exercise their ingenuity and resourcefulness.
• **Communicate** and **support** one another.
NATIONAL & REGIONAL INITIATIVES

Advising/being decision-makers, representing CE.

National ‘technical due diligence’

 Delivering new facilities

Developing new systems, processes and resources
• Logistics hub(s)
• Maintenance provision
• Training resources
  (unfamiliar equipment, lack of manuals)
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• Logistics hub(s)
• Maintenance provision
• Training resources (unfamiliar equipment, lack of manuals)
to deliver expanded services. Support procurement, logistics.

to forecast – *early, completely.*

to enable/evaluate novel solutions.

to mitigate…
• Device availability shortage
• Workforce & space shortage
• Training resource gaps
• Realising the value of our teams in achieving this

Proactivity inspires confidence!
LOCAL INITIATIVES AND LEARNING

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to mitigate….
• Device availability shortage
• Workforce & space shortage
• Training resource gaps
• Realising the value of our teams in achieving this

Clinical Engineering Team, Medical Physicist volunteers
GSTT COVID equipment retrieval and Library team
**LOCAL INITIATIVES AND LEARNING**

*to deliver* expanded services. Support procurement, logistics.

*to forecast* – *early, completely.*

*to enable* / evaluate novel solutions.

*to mitigate*…
- Device availability shortage
- Workforce & space shortage
- Training resource gaps
- Realising the value of our teams in achieving this
Direction of travel
FUTURE DIRECTIONS

Engineering the system itself

The role of information/informatics.

Cross – professional engagement.

On collaboration in Europe.
The future: engaging sooner and more, at a system level?

- National organisation of HTM
- Regional organisation of HTM
- Local (hospital) organisation of HTM
- The clinical reality

Scale of decisions, down stream impact

Actual Clinical Engineering involvement
Main challenges

• **Definition of what was needed and when.** The development of the outbreak (especially in the region where I live) didn’t allow us to think enough, resulting in a continuous “add on” solution that might end up being effort consuming. In our region in less than a month 700 ventilators and 1100 monitors where acquired (gross numbers just to give you an idea). It’s hard to be effective in such a mess, not considering the fact that many times such devices were never seen before, not CE marked, not completely compliant to regulations and “normal” activation protocols;

• **Procurement of devices:** the timing of public procurement (especially when buyers don’t want to expose themselves to non standard procedures – although allowed), the mess we experienced between local, regional and national procurement together with the solutions adopted for distribution of devices added up complications in handling the outbreak;

• **Know How:** We had to acquire some sort of know how (compatible to the time available) on devices we had never really considered before. Some of us now are expert on CPAPs, who would have thought before?

• **Rest of the hospital:** Although concentrated on ER, intensive care and building up new wards, we had to deal with patients suspected or known positive to Covid 19 that had to undergo life saving therapies. Think about patients undergoing dialysis, oncology treatment, etc.;
Lessons learned and best practices

• ICs in Italy proved to be both resilient and reactive, since we were able to react to the outbreak. The network established between colleagues and the knowledge of the market and of vendors helped us handle the emergency;

• We need to re-think our hospitals and our assets. We are running on a “just what we need basis” without too many backups, different options and solutions. The perfect solution to this might not be double up everything in each hospital, but we should at least have something available that could be used as a cushion to absorb the shock of events that couldn’t be seen in advance.

• We were concentrated on hospital treatment of patients. This was probably a need when the outbreak became clear, but ended up in a significant effort that made it possible for us to treat many patients but stressed the system a lot. Besides many other patients couldn’t be treated in a proper way. It is clear now that those who made it possible to monitor patient at home using telemedicine and telemonitoring solutions reduced the stress applied on hospitals thus resulting in a lower load on hospitals and CEs working there. Probably this situation made crystal clear what we’ve been saying theoretically for some time, but still we weren’t ready do deploy the theory into practice
Future work

• **Dig into a deeper collaboration among us** and with national and international institutions. CE networks can help share expertise and information from a technical point of view.

• Wrap up all we’ve been doing in the past month or so in order to try and **write guidelines** on device availability, technology configuration for specific wards, etc, although we know that each situation might have different needs. We need to work together as HTM professionals throughout Europe to **describe scenarios** that could be easily adapted to different situations. It might be then useful to share and discuss such ideas with clinicians and scientific associations.

• **Interact with institutions** to provide them with ideas and solutions and it would be useful to have CEs inside such institutions, being procurement facilities (so that we end up buying what we really need and not something that looks like what we’re looking for), regulatory boards both on a national and European level.