

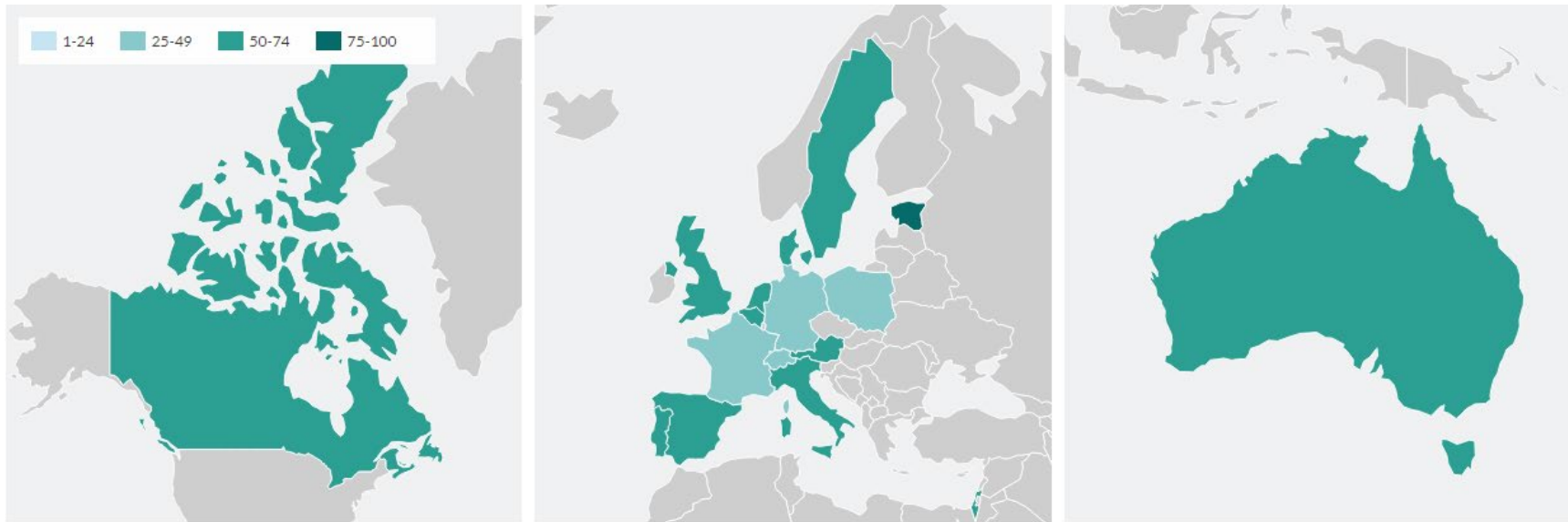
First Automatic: Feedbacks on an innovative solution to optimize and secure pre-analytic step

Dr. med. Christoph Ganter, eMBA

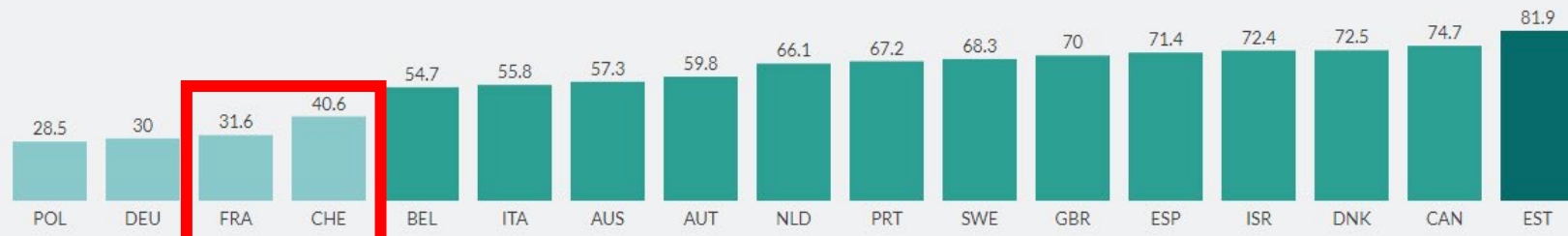
Digital transformation in healthcare



Digital Health-Index

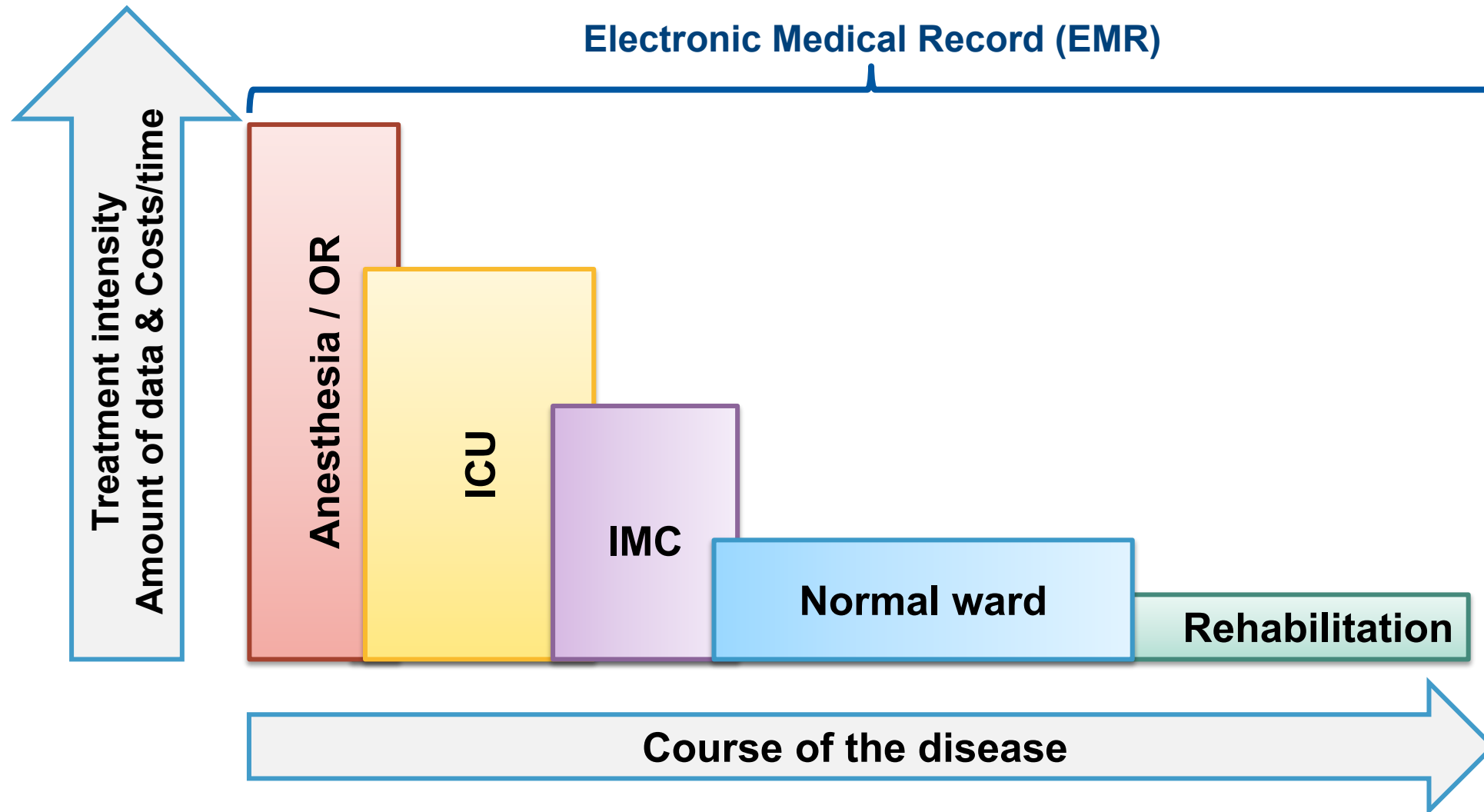


Digital Health Index





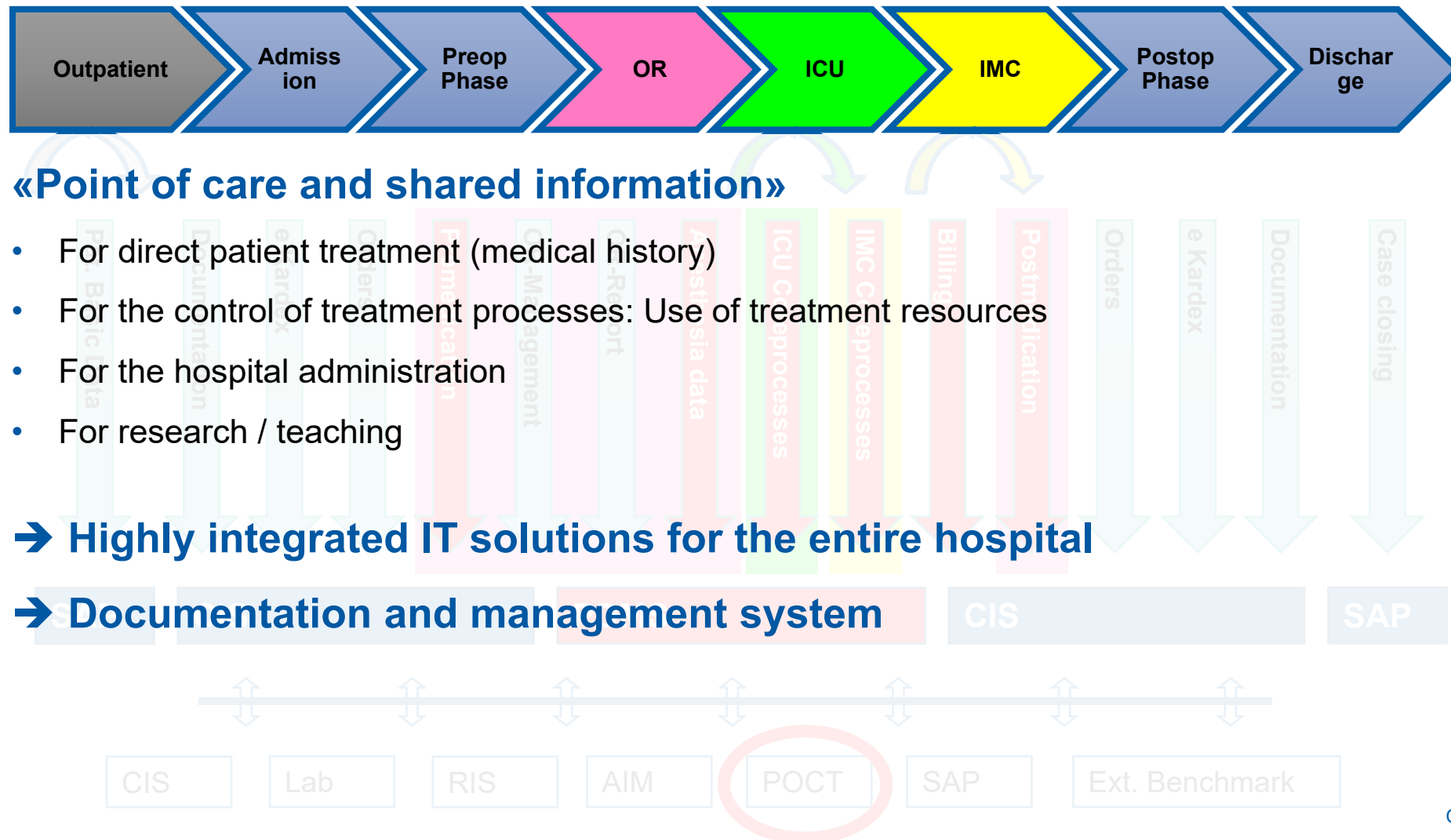
Why do we need better digitalisation in acute care?



Digital systems in hospitals (Electronic medical records = EMR)

- **CIS: Clinical Information System**
- **PDMS: Patienten Data Management System**
- **POCT: Point Of Care Testing Software**
- **RIS: Radiology Information System**
- **AIM: Advanced Image Management**
- **Lab Software**
- **Billing Software**
- ...

EMR along integrated patient- / treatment- / documentation- / billing- processes in a hospital



FIRST AUTOMATIC – the right result for the right patient

RADIOMETER 



1st Automatic **automates** and **simplifies** the processing of the blood sample and the handling of the results

Sample Collection

safePICO samplers
Pre-barcoded



Sample and data registration

AQURE FLEXLINK
POCT – IT-Solution



Sample mixing and

Analyzers of the ABL series



**Result Transmission to the
patient's bedside and in EMR**

Sample processing

Blood sampling

safePICO aspirator – arterial sampler (1ml)



Blood sampling

safePICO aspirator should be filled slowly by aspirating the blood



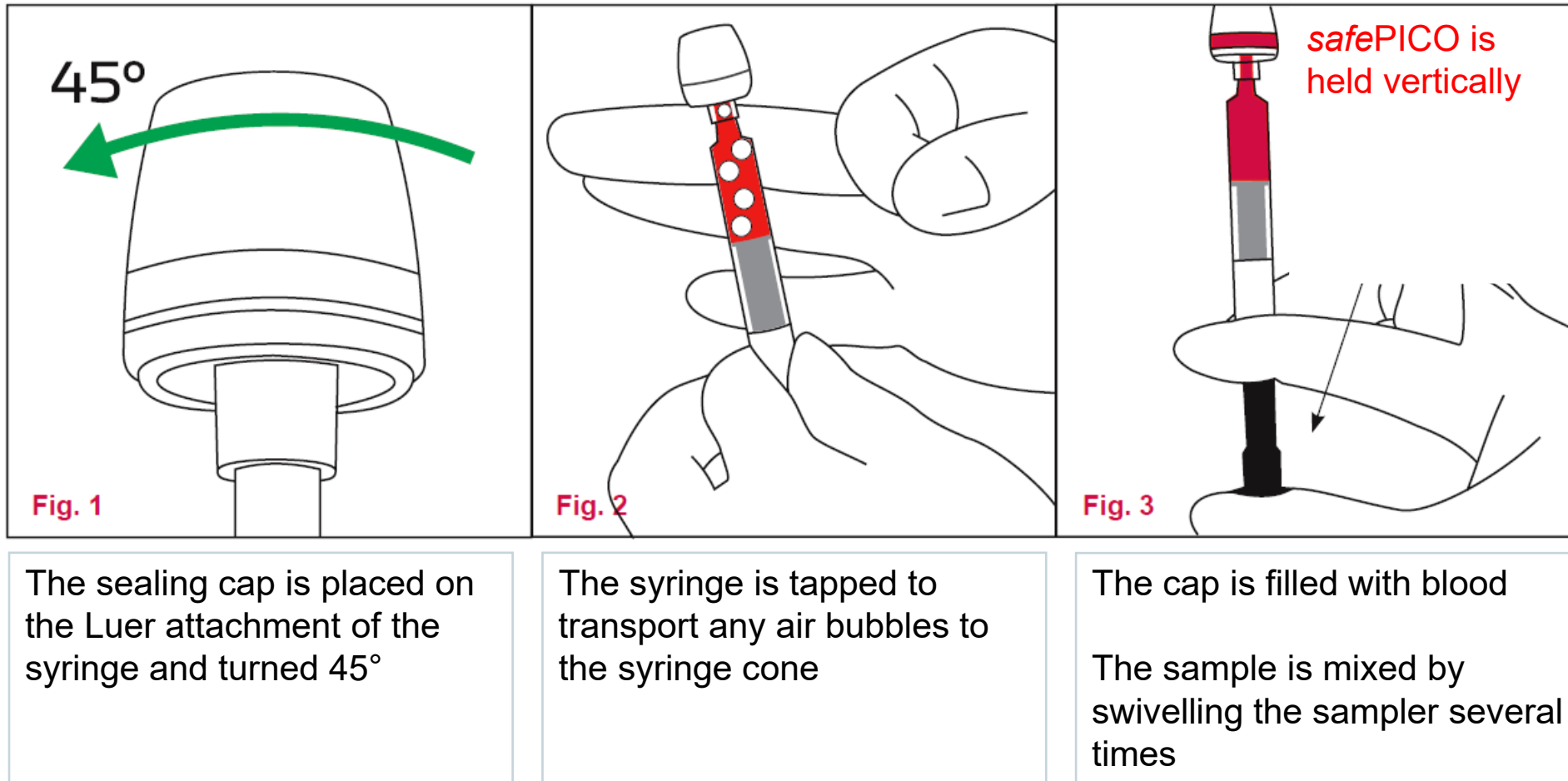
Blood sampling

safePICO self-fill – arterial sampler



Blood sampling

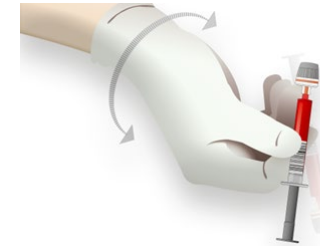
safeTIPCAP is attached firmly to the Luer – air is expelled



Immediately after sampling

There are four important points to note

1. Possible air bubbles are ejected
→ No falsified results
2. Sample is mixed gently
→ Reduction of clot formation
3. Sample is measured immediately after collection
→ Reduction of biochemical changes
4. Sample is mixed before measuring
→ No sedimentation - reliable values



Correct sample registration directly at the patient's bedside

- Reduced risk of confusion between patient ID and sampler ID
- Patient master data are transmitted via an IT-interface (No manual data entry on the device patient)
- Simple, web-based, at the bedside

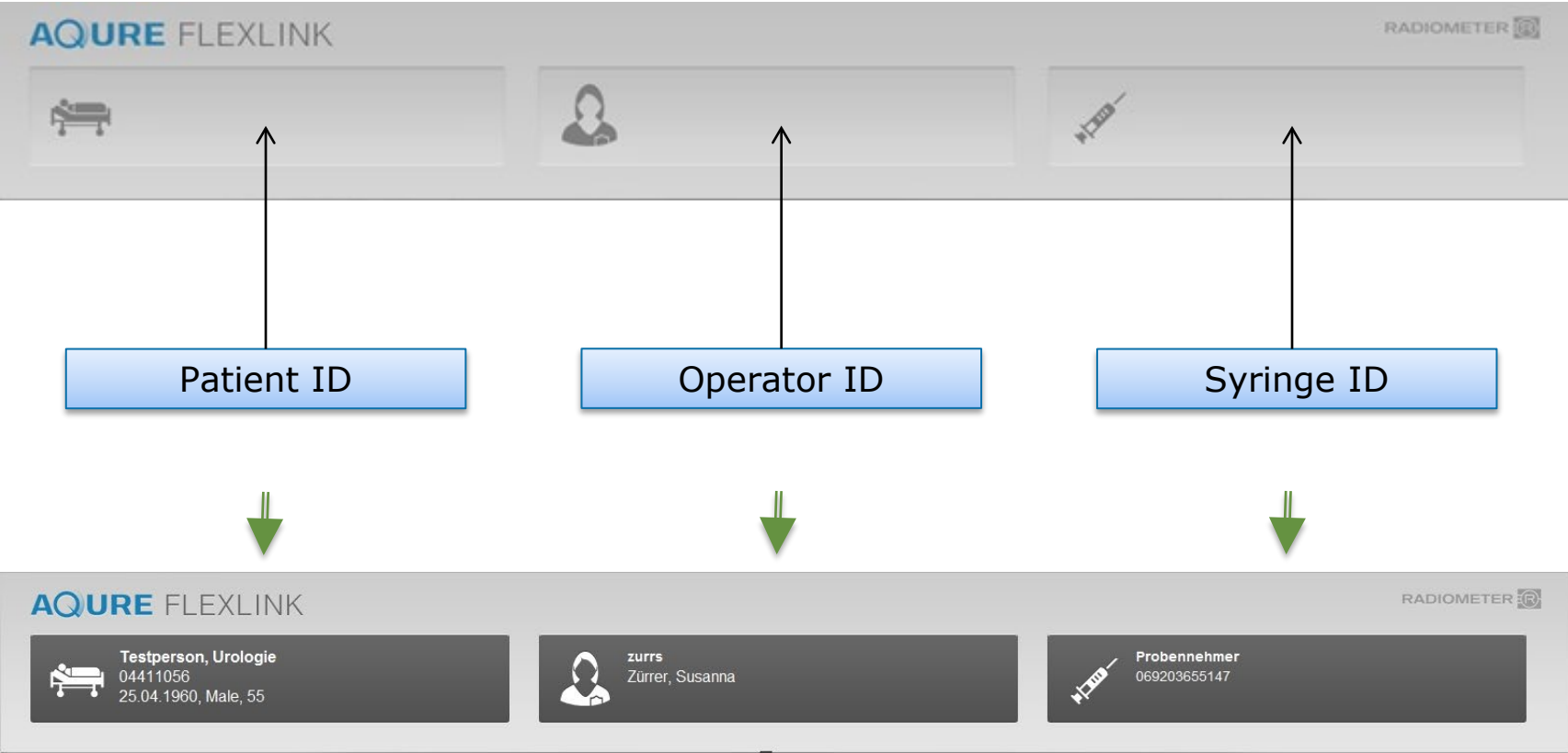
The screenshot displays the AQUIRE FLEXLINK web interface. At the top, it shows the patient's name 'Mc Brown, Kathrin', ID '091463', and date of birth '19480815'. The interface is divided into sections for 'Approve', 'Information', 'More', 'Measurement', and 'Unknown'. The 'Measurement' section contains a table of laboratory results.

	Unit	11/21/2012 10:38 AM	11/21/2012 10:41 AM
Approve			
Status		Approved	Approved
Rejection comment?			
Information			
Result status		Failed	Failed
Sample type		Unknown	Unknown
More			
Measurement			
pH		7.389	7.393
pH(T)		7.381	7.386
pCO2	kPa	5.51	5.49
pCO2(T)	kPa	5.65	5.62
pO2	kPa	16.7	17.8
tHb	mmol/l	6.8	6.8
COHb	%	—	—
MetHb	%	—	—
K+	mmol/l	—	—
Na+	mmol/l	—	—
Ca++	mmol/l	—	—
Cl-	mmol/l	—	—
Unknown			
cBase(Ecf)	mmol/l	0.1	0.3

At the bottom of the interface, there are buttons for 'Show messages', 'Show ranges', and 'Register new'. The status bar at the very bottom indicates 'Local intranet | Protected Mode: Off' and '100%' zoom.

FLEXLINK sample registration

scan fields



FLEXLINK sample registration

Scanning of barcode can be in any order & confirmation

The screenshot shows a web browser window with the URL `http://vm-90262/FlexLink/Registration/Wizard`. The browser tabs are labeled "AQUIRE FLEXLINK" and "Radiometer - AQUIRE". The page has a green header bar with the text "Der Patient Urologie Testperson wurde gescannt". Below the header, there are two dark grey boxes: the first contains a bed icon and the text "Testperson, Urologie", "04411056", and "25.04.1960, Male, 55"; the second contains a person icon and the text "zurrs", "Zürer, Susanna". To the right of these boxes is a grey box with a syringe icon. Below these boxes is a large grey area with the text "Scannen: (Patienten, Bediener oder Probennehmer)" and a vertical line. Two green boxes with arrows point to this area: "Any Order" points to the left side of the vertical line, and "Confirmation" points to the right side. At the bottom right, there are two buttons: "Zurücksetzen" (grey) and "Registrieren" (blue).

Der Patient Urologie Testperson wurde gescannt

Testperson, Urologie
04411056
25.04.1960, Male, 55

zurrs
Zürer, Susanna

Scannen: (Patienten, Bediener oder Probennehmer)

Any Order

Confirmation

Zurücksetzen

Registrieren

FLEXLINK sample registration

incomplete registration: Patient-ID is missing!

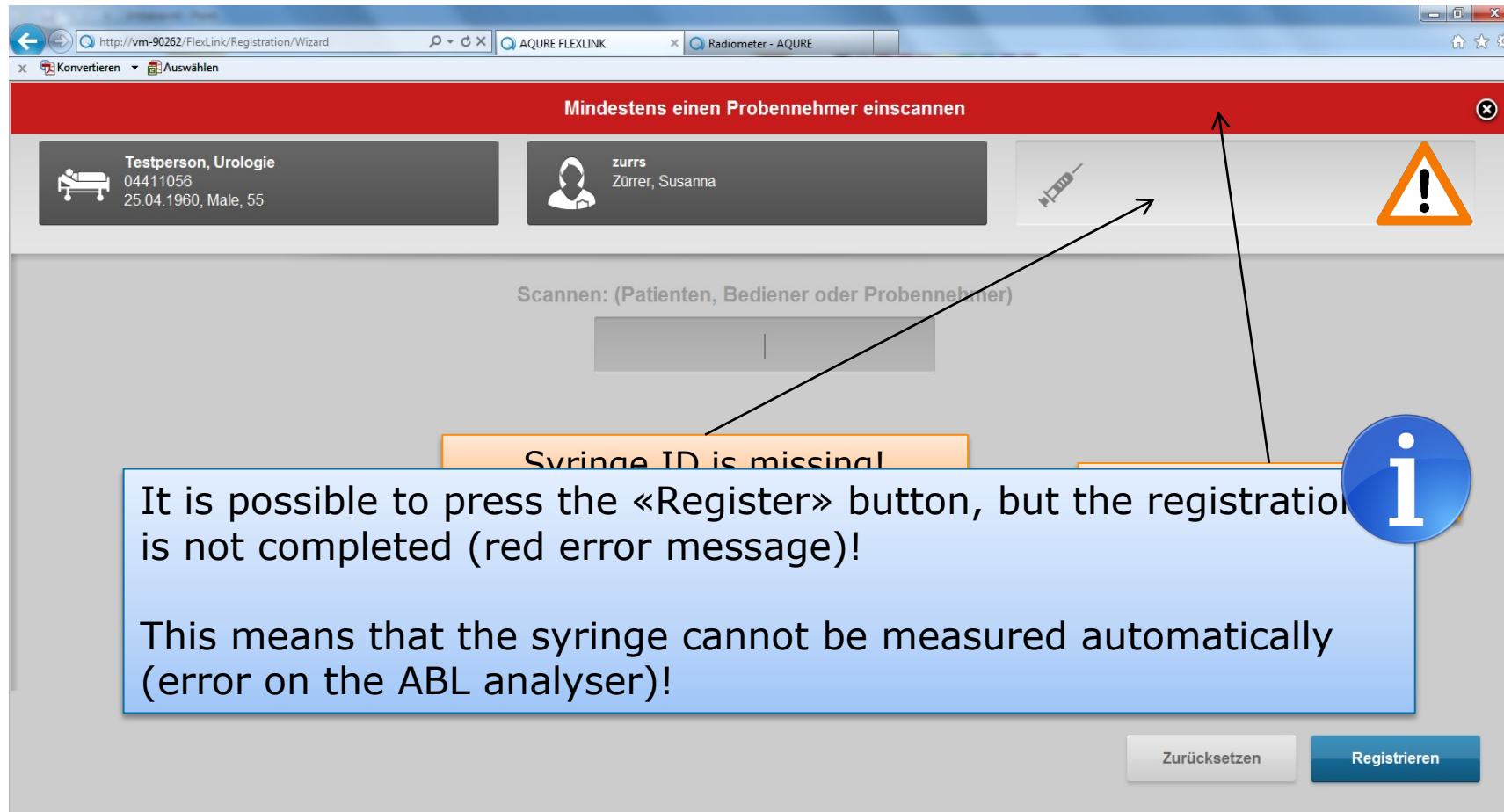
The screenshot shows the 'Patienten einscannen' (Scan patient) interface of the FLEXLINK system. The browser address bar indicates the URL is `http://vm-90262/FlexLink/Registration/Wizard`. The interface has a red header bar with the title 'Patienten einscannen'. Below the header, there are three main sections: a patient icon, a patient information box, and a sample box. The patient information box shows 'zurrs Zürer, Susanna'. The sample box shows '1 Probennehmer'. Below these sections, there is a 'Scannen: (Patienten, Bediener oder Probennehmer)' (Scan: (Patient, Operator or Sample)) section with a text input field. Below the scanning section, there is a table with the following data:

Standard	069203655147	Arteriell	Nicht spezifiziert	37.0

At the bottom right, there are two buttons: 'Zurücksetzen' (Reset) and 'Registrieren' (Register). An orange box labeled 'Patient-ID not scanned' points to the patient information box. Another orange box labeled 'Error message' points to the red header bar.

FLEXLINK sample registration

incomplete registration: syringe ID is missing!



FLEXLINK sample registration

registration complete!

The screenshot shows the AQUIRE FLEXLINK web application interface. At the top, the browser address bar displays the URL: `http://vm-90262/FlexLink/Registration/SamplerRegistration/0692l`. The application header includes the "AQUIRE FLEXLINK" logo and the "RADIOMETER" logo. Below the header, three registration cards are displayed, each with a green checkmark icon indicating successful registration:

- Testperson, Urologie**
04411056
25.04.1960, Male, 55
- zürs Zürer, Susanna**
- Probennehmer**
069203655147

Below these cards, the "Parameterprofil" section has two tabs: "Standard" (selected) and "Dialyse". To the right of this section, a green callout box contains the text: "All 3 IDs are correct!".

The "Probentyp" section features a row of buttons: "Nicht spez.", "Arteriell" (selected), "Venös", "Kapillare", "Gemischt Venös", and "Leistungstest". Below this, the "Spez. Probentyp" section has a row of buttons: "Nicht spezifiziert" (selected), "Pulmonalarteriell", "Zentralvenös", "Jugularvenös", "ECC Venös", "ECC Arteriell", and "HF Postfilter".







The "Temperatur" section shows a value of 37.0 with "+" and "-" buttons and a "C" unit indicator. The "FIO2" section shows a value of 0.21 with "+" and "-" buttons and a "%" unit indicator.

At the bottom right, there are two buttons: "Scannen" and "Registrieren". A large green arrow points down towards the "Registrieren" button, indicating the final step in the registration process.

FLEXLINK sample registration

registration complete, but...

AQURE FLEXLINK RADIOMETER

 unbekannt, unbekannt... 123456789 01.01.1900, Unknown,...		 zurrs Zürner, Susanna		 Probennehmer 011169562135	
------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------

All 3 fields correct!

Even if all 3 fields are displayed as "scanned",
the Patient-ID field may contain an unknown ID.

The measurement at the ABL will work automatically, but
the result cannot be transmitted in the EMR (electronic
medical record)!

FLEXLINK sample registration

correct completion of registration

Die Probennehmerregistrierung wurde aktualisiert.

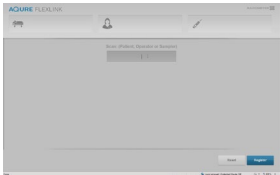
	Einheit	13.07.2015 20:08	13.07.2015 22:44	13.07.2015 23:19	14.07.2015 02:04	14.07.2015 05:30	# 069203655147
▼ Information							
Ergebnisstatus		OK	OK	OK	OK	OK	
Sample number		221902	221911	221912	221930	221942	
Probentyp		Arteriell	Arteriell	Arteriell	Arteriell	Arteriell	
Spez. Probentyp		Nicht spezifiziert	Nicht spezifiziert	Nicht spezifiziert	Nicht spezifiziert	Nicht spezifiziert	
► Mehr							
▼ Messwert							
pH		7.458	7.439	7.466	7.423	7.430	
pCO2	kPa	4.52	4.67	4.33	5.22	4.97	
pO2	kPa	17.1	9.88	10.5	15.5	14.3	
Hct	fraction	0.318	0.296	0.277	0.299	0.277	
tHb	g/l	103	95	89	97	89	
sO2	fraction	0.991	0.949	0.963	0.983	0.981	
K+	mmol/l	5.6	5.5	5.5	5.1	4.5	
Na+	mmol/l	134	134	134	135		
Cl-	mmol/l	102	102	105	102		
Ca++	mmol/l	1.14	1.19	1.13	1.17		
Lac	mmol/l	1.1	1.5	1.4	1.1	1.1	
Glu	mmol/l	5.7	8.6	8.7	8.9	8.6	
Posm	mmol/kg	274.0	277.5	277.3	278.6	280.8	
SBE	mmol/l	0.2	-0.3	-0.2	1.1	0.5	
pHCO2 (B-c)	mmol/l	24.0	24.2	24.6	25.5	25.0	

Warte auf Probenn...

Confirmation

Waiting for new results

Meldungen anzeigen Bereiche anzeigen Neu registrieren



Do you have to wait readiness of the analyzer?



FLEXQ of the ABL analyzer

- Place up to three safePICO samplers on the FLEXQ and you're ready to go
- Your samples are automatically scanned, mixed, aspirated, analyzed and then the values are printed out / sent to EMR

➔ No waste of time in front of the analyzer!



ABL analyser sample measurement

sample registered correctly



ABL sample measurement

Different statuses – LED colour

The screenshot displays the ABL837 FLEXQ interface. At the top, there's a header bar with 'Ansaugung' and a progress bar, followed by icons for 'Analysator Status' (traffic light), 'Datei Archiv' (folder), and 'Hilfe' (question mark). Below this is a row of green buttons for various parameters: pH, pCO₂, pO₂, Na⁺, K⁺, Ca⁺⁺, Cl⁻, Glu, Lac, and Crea.

The main display area shows the 'ABL837 FLEXQ' logo. Below the logo, a blue box indicates 'Bearbeitungszeit für neue Probe: 00:06:30' and a button for 'Dringende manuelle Probe'. A table lists three samples with their status and corresponding LED colors:

Pos.	Nachname	Zeit bis Ergebnis	Status
1	Johnson		Beendet: ?
2	Doe	00:01:20	In Bearbeitung
3	Cameron	00:03:50	Bearbeitungsbereit

Arrows point from the status text to callout boxes on the right:

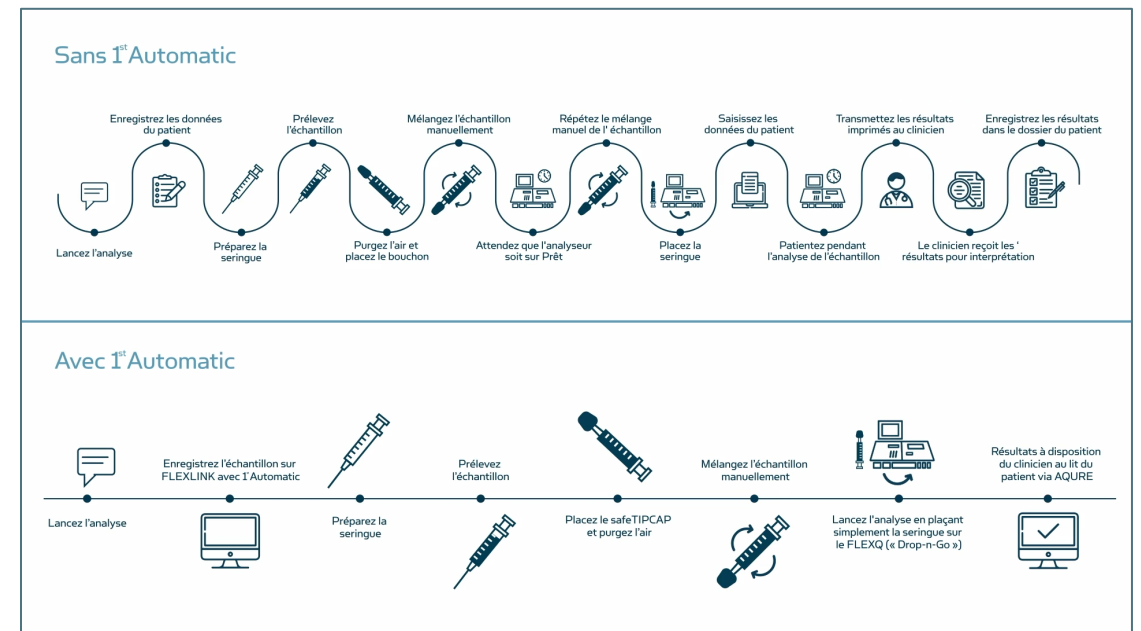
- Green arrow from 'Beendet: ?' points to 'Sample measurement performed'.
- Yellow arrow from 'In Bearbeitung' points to 'Sample measurement started'.
- Yellow arrow from 'Bearbeitungsbereit' points to 'Sample measurement pending'.

The bottom bar contains icons for 'Menü', 'Abmelden Fernzugriff', 'Tutorium', and a clock showing 16:00 to 13:54, along with other system icons like 'Niemals', 'Radiance', and 'Remote'.

First Automatic – AQUIRE FLEXLINK with ABL analysers

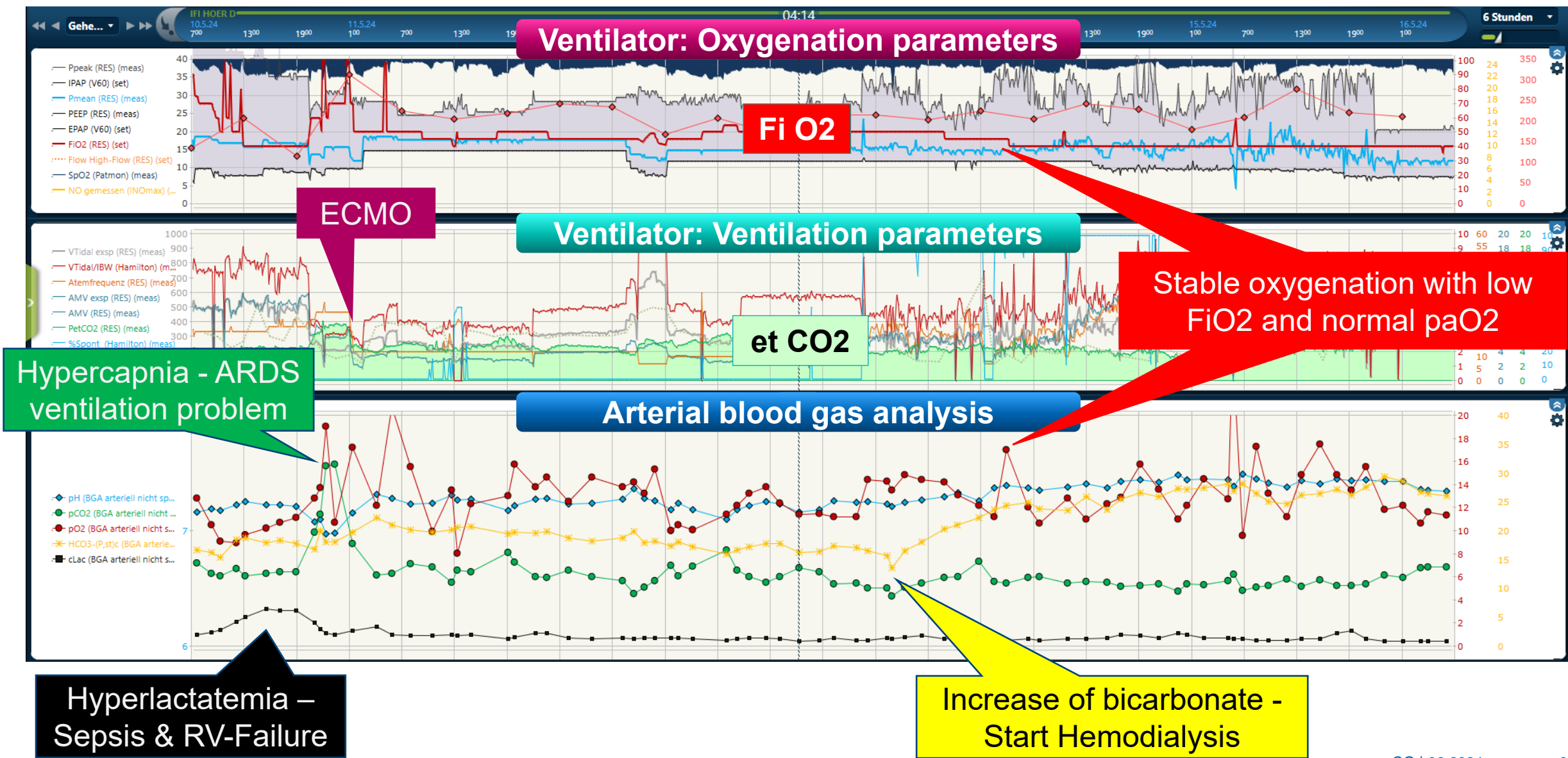
Closed loop communication system directly at the patient's bedside:

- ✓ Sample assigned to the correct patient
- ✓ Correctly identified samples
- ✓ No transmission errors
- ✓ Complete data in the medical record
- ✓ All results are billable
- ✓ No waiting times
- ✓ Optimal utilization of the analyzer

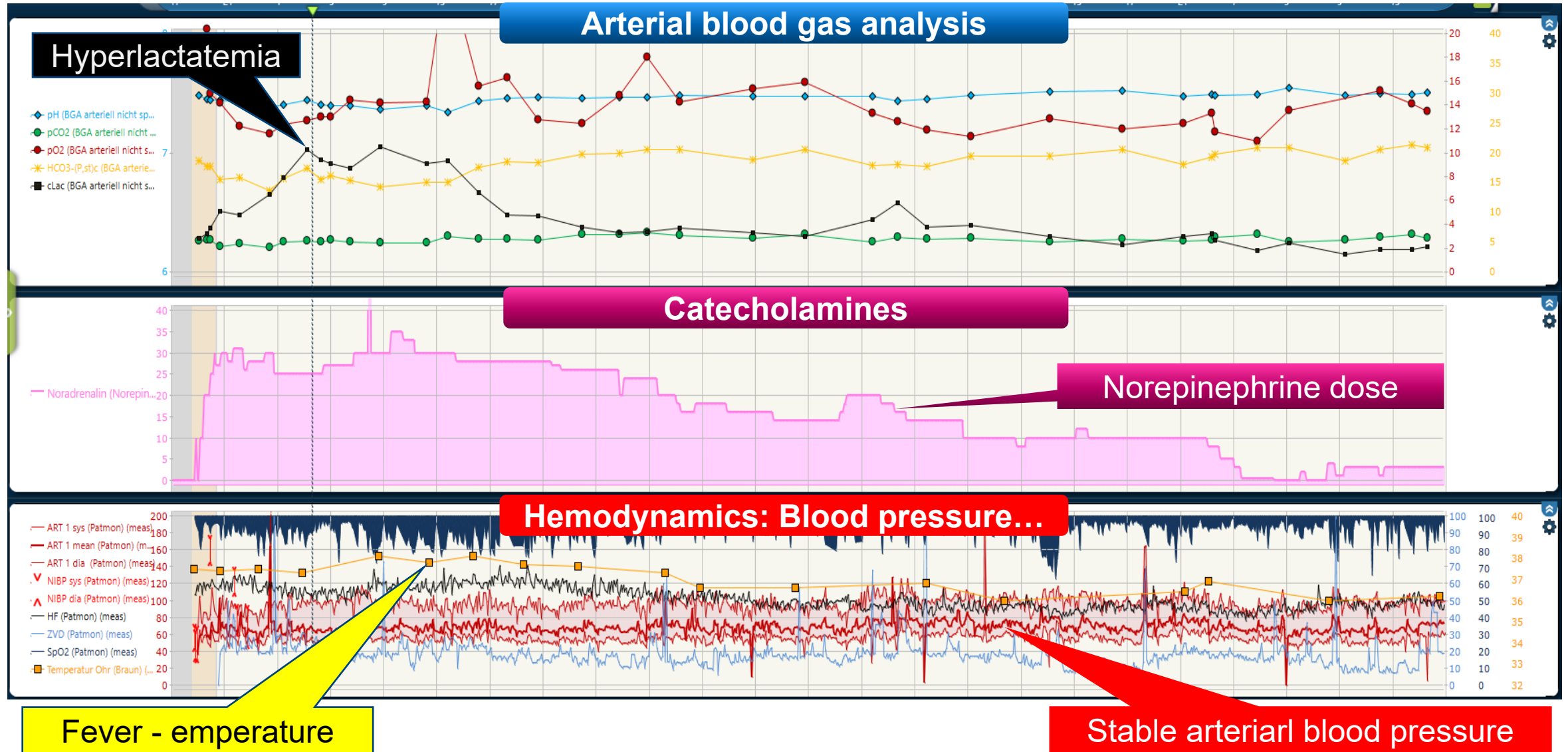


Practical examples

1 – week trend in EMR: Pneumonia-ARDS on VV-ECMO



4 – days trend in EMR – Septic shock due to cholangitis



AI (Artificial Intelligence) in ICU

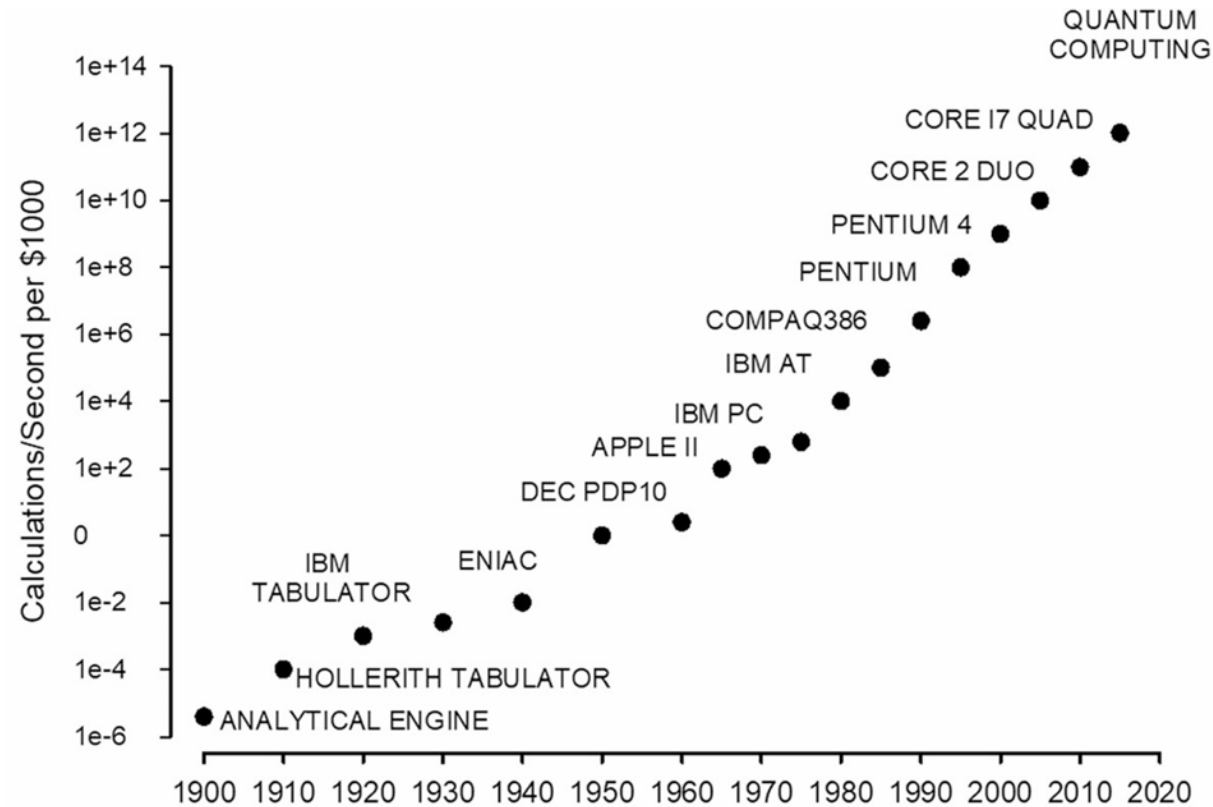


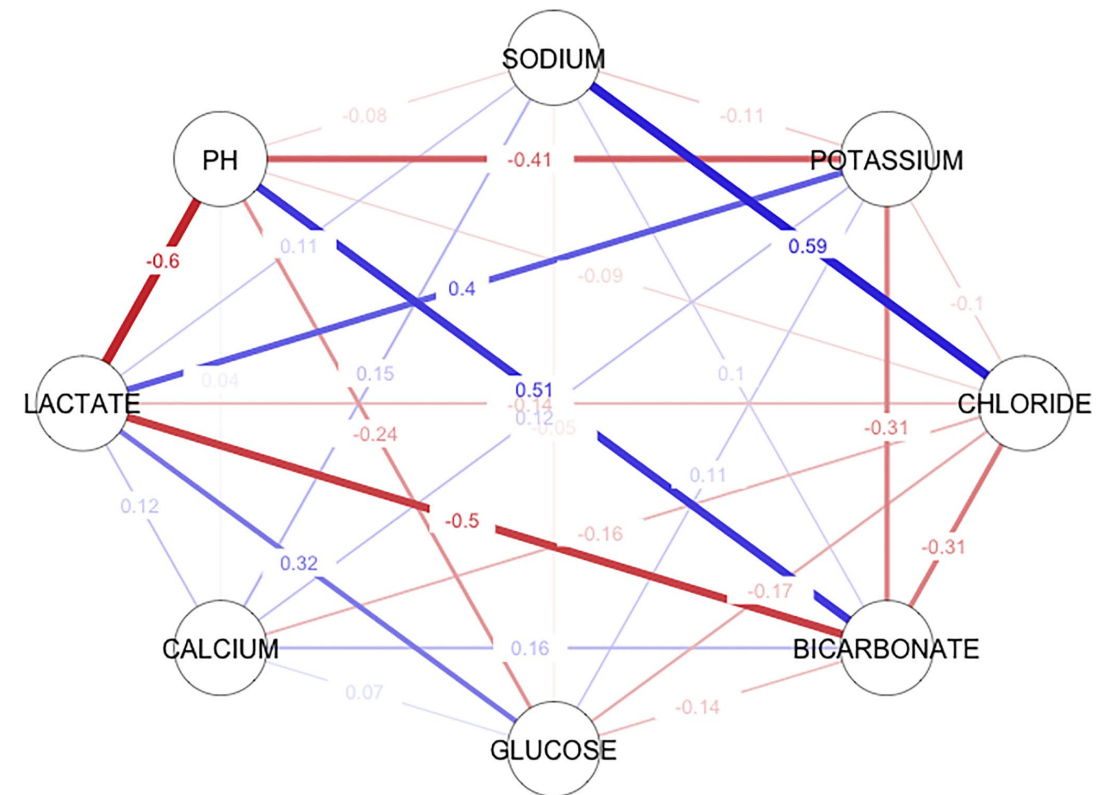
Fig. 1 The growth of computer power, based on calculations per second purchased by \$1000 USD (constant 2015) during the past century. Also shown are significant developments in technology associated with increases in computer power. Modified from <https://www.flickr.com/photos/jurvetson/25046013104> (with license). Original graph in Ray Kurzweil. "The singularity is near: When humans transcend biology," p67, The Viking Press, 2006

A deep learning backcasting approach to the electrolyte, metabolite, and acid-base parameters that predict risk in ICU patients

Albion Dervishi *

Department of Anesthesiology and Intensive Care Medicine, Medius Clinic Nürtingen, Academic Teaching Hospital of the University of Tübingen, Tübingen, Germany

1. Correlation of the electrolyte, metabolite, and acid-base parameters between ICU patients who **remained stable (blue)**
2. and those who physiologically **deteriorated and died in 0–8 hours (red)**



Summary - First automatic is a solution for

Improvement of the treatment quality through

- Digitalisation of documentation and communication
- Increasing the quality of treatment documentation (legibility, traceability...)
- Reduction of errors (sample / patient confusion)

Optimisation of processes and workflows

- Automated data flows with interfaces to IT environment systems: CIS, EMR, Lab-/ Billing systems...
- More efficient quality management and complete billing
- Time savings through reduction of documentation

Thank you for your attention

