European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

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XXIX CONGRESSO NAZIONALE

7-9 Novembre 2024
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L'intelligenza artificiale: dall'ALR alla gestione delle vie aeree.

- **Elena Bignami**
- Head of Anesthesiology and Intensive Care Unit, AOU Parma
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- University of Parma, Italy
- President-elect SIAARTI 2025-2027
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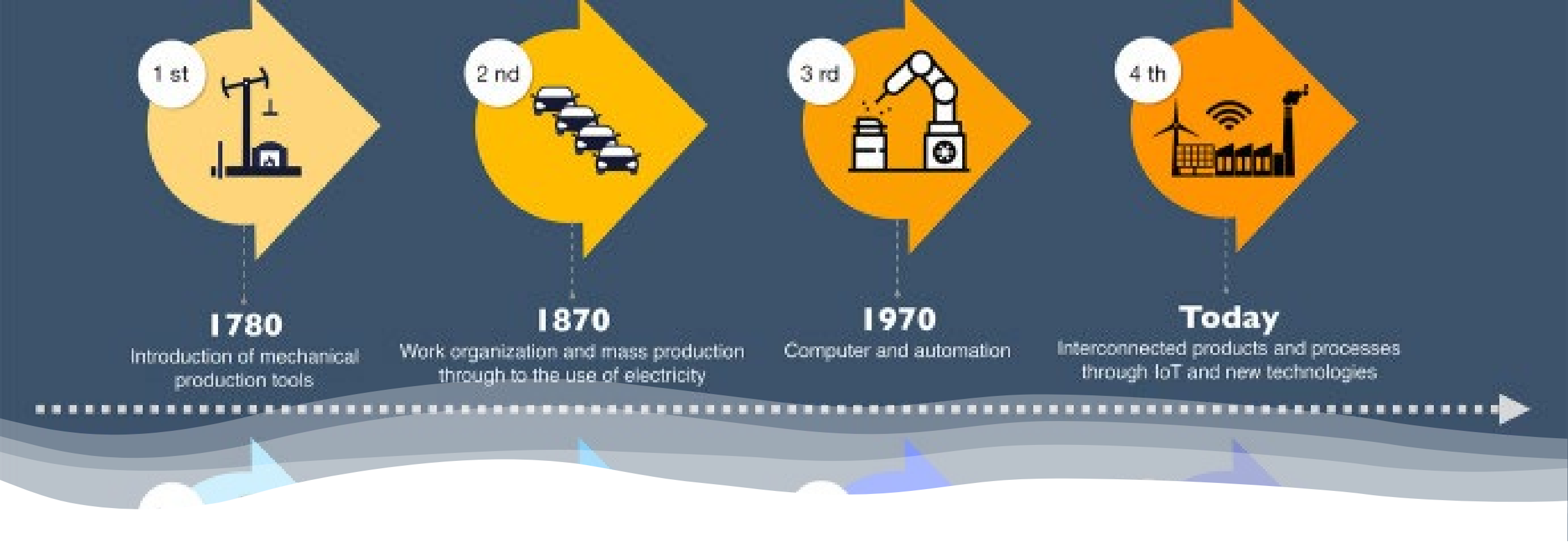
- Medico in formazione specialistica in Anestesia, Rianimazione, Terapia Intensiva e del Dolore dell'Università di Parma

UNIVERSITÀ DI PARMA

SIAARTI
PRO VITA CONTRA DOLOREM SEMPER

Conflict of interest

None



Bellini, Bignami et al. *Ann Transl Med.* 2022

L’evoluzione dell’anestesiologia

L’evoluzione dell’anestesiologia

- 16 ottobre 1846
- Dott. Morton (dentista)
- Etere

- Sala del Massachusetts General Hospital
- Poi…il chirurgo John Collins Warren asportò un tumore del collo al volontario, il signor Albert Abbott, che non provò alcun dolore

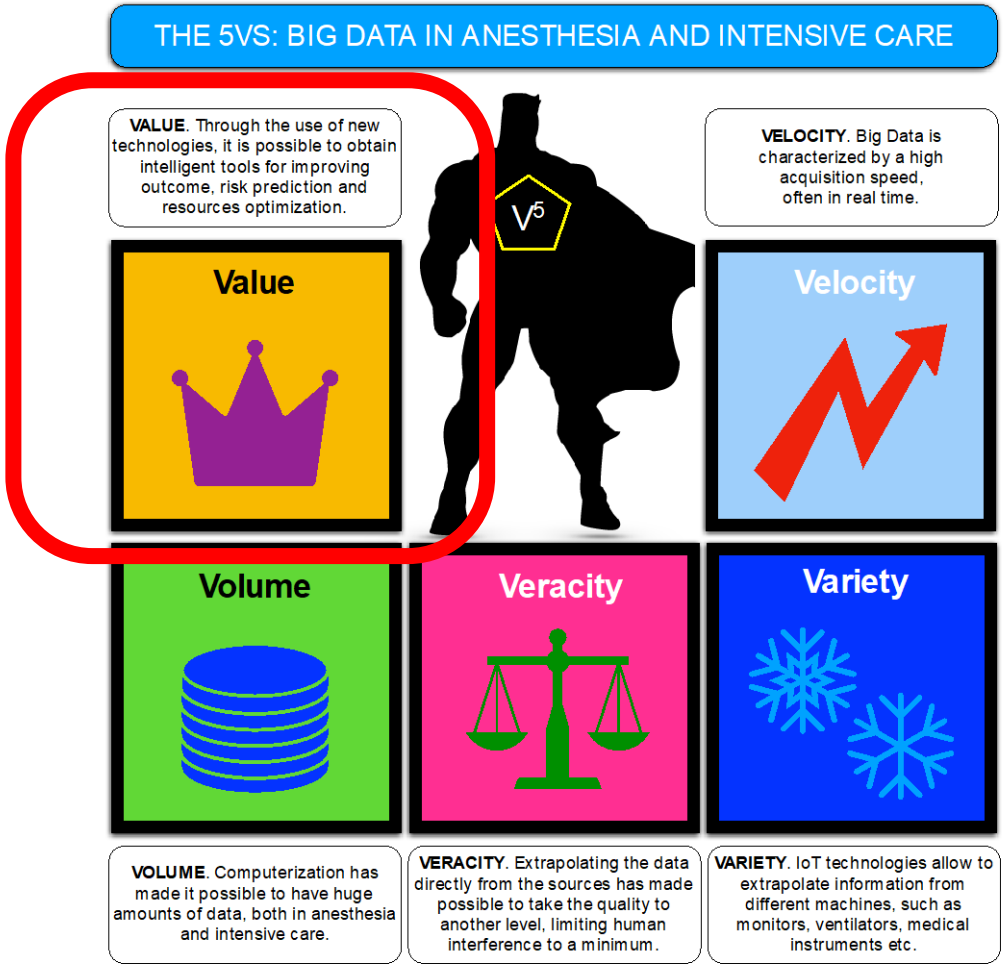
Big Data, il nuovo oro nero

Big Data, il nuovo oro nero

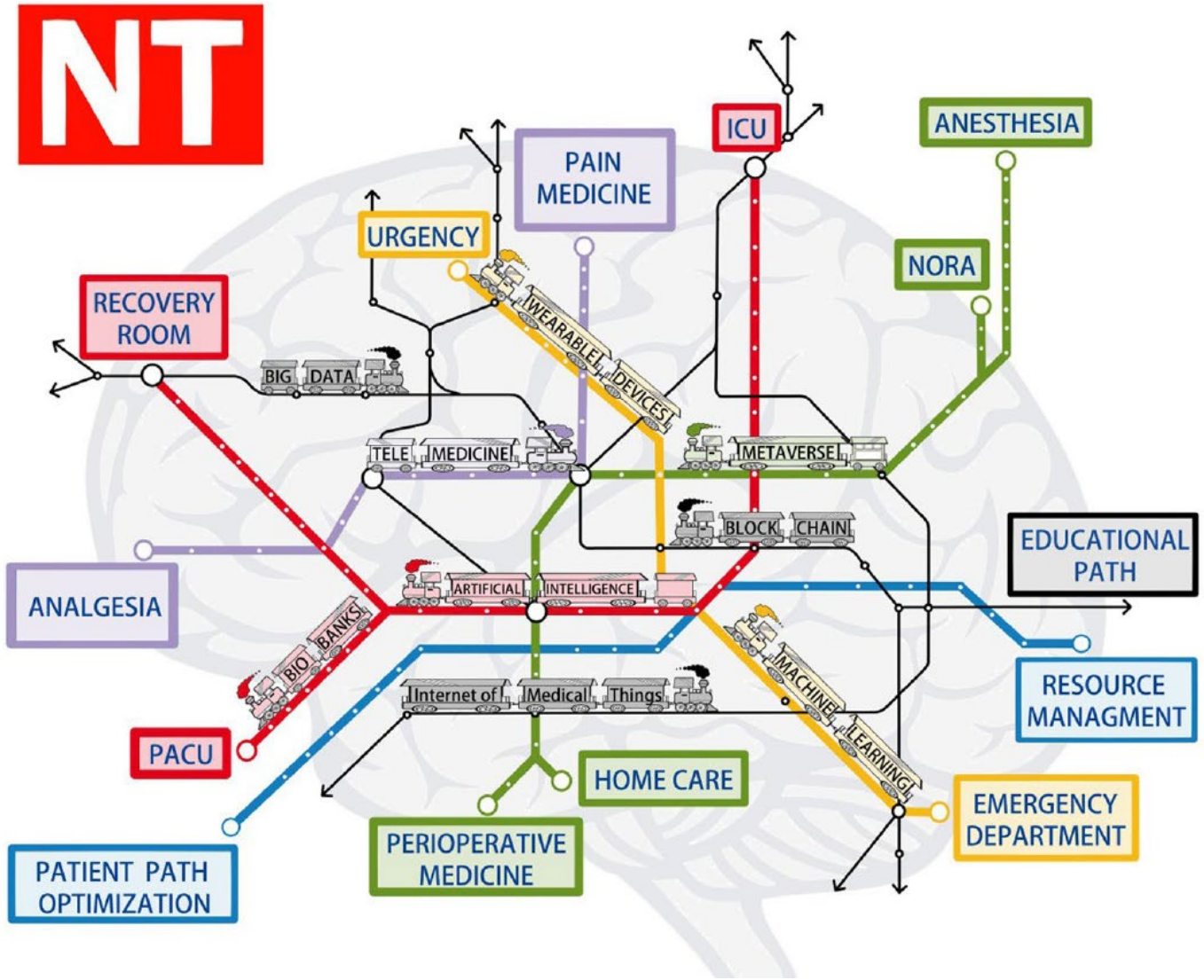
Table 1. Examples of types of data available in the operating room (examples can vary by practice)

	Data created as part of standard of care	Data NOT routinely created as part of standard of care
Data routinely recorded	• Vital signs • Most radiographic images • Selected device data (e.g., ventilation) • Administrative (e.g., supplies)	• Research
Data NOT routinely recorded	• Patient data (e.g., images, video, audio) • Device data (e.g., table position, energy device electric resistance measures, stapler pressure measurements, *etc.*) • Surgeon data (e.g., kinematics, eye tracking) • Healthcare team interactions (e.g., operating room "black box")	• Research

Schnelldorfer et al. *Art Int Surg*. 2024



Bellini, Bignami et al. *Neurocrit Care*. 2022



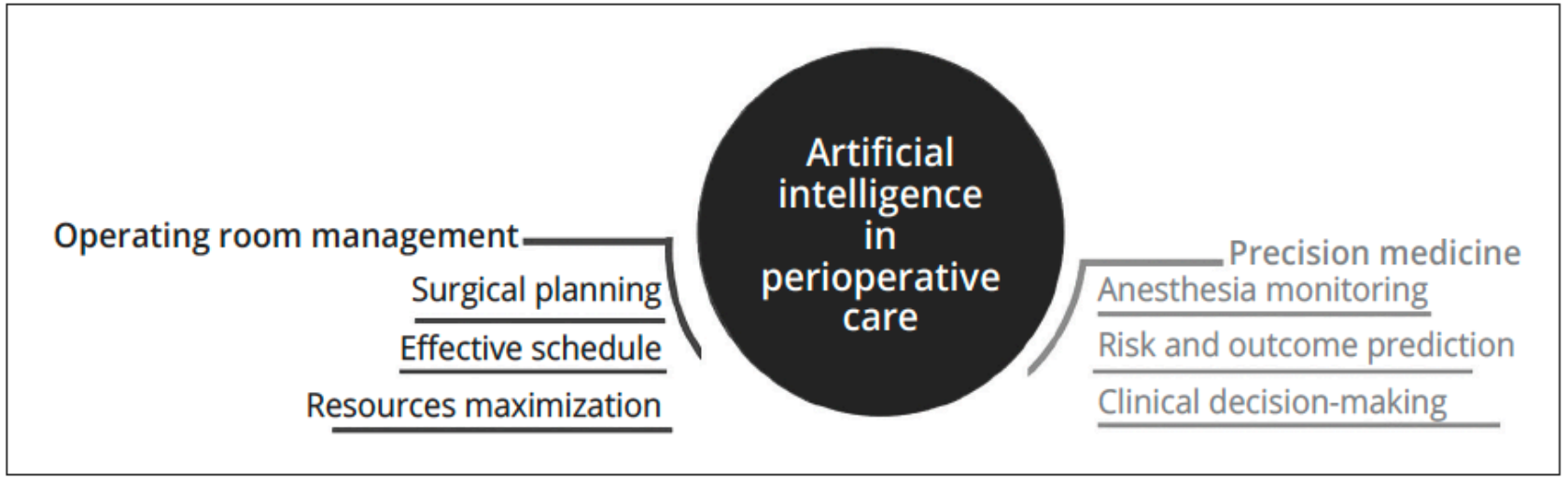
Bignami et al. *J Anesth Analg Crit Care*. 2023

Le nuove tecnologie

1. Intelligenza artificiale predittiva
2. Intelligenza artificiale generativa
3. Wearable device e telemedicina
4. Metaverso
5. Robotica

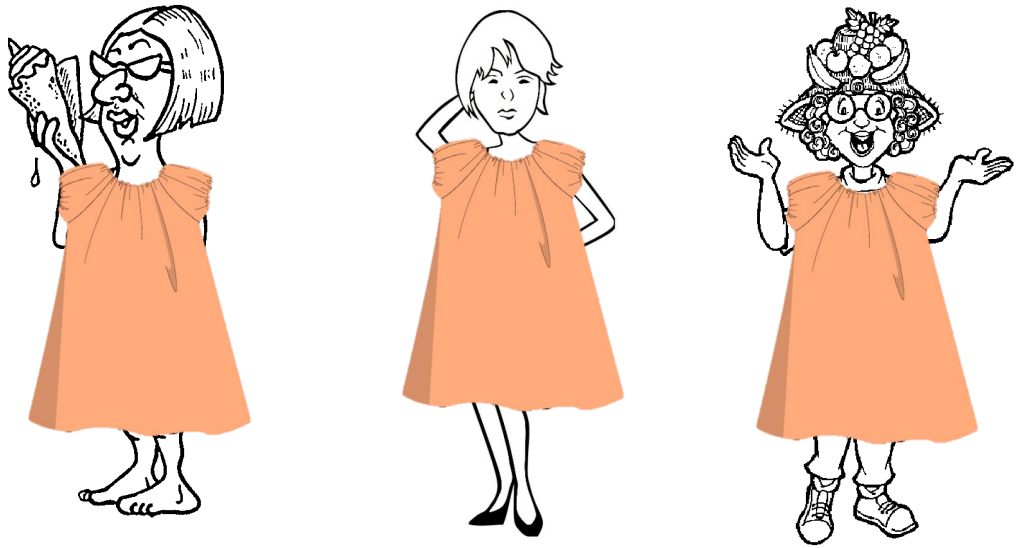
INTELLIGENZA ARTIFICIALE

Figure 1.—Role of artificial intelligence in perioperative medicine. Its role is twofold. It can be used both to optimize the organization and efficiency of the operating room, and to maximize the personalization of perioperative care.



PARMAI
PERIOPERATIVE MEDICINE

Bellini, Bignami et al. *Minerva Anest*. 2022



SCORE «INTELLIGENTI»

Passare da score di rischio "generici" a score "su misura", specifici per ogni paziente e per la procedura, ottenuti talvolta anche in tempo reale

THE OPEN MIND

Beyond Artificial Intelligence: A Critical Appraisal From An Airway Management Perspective

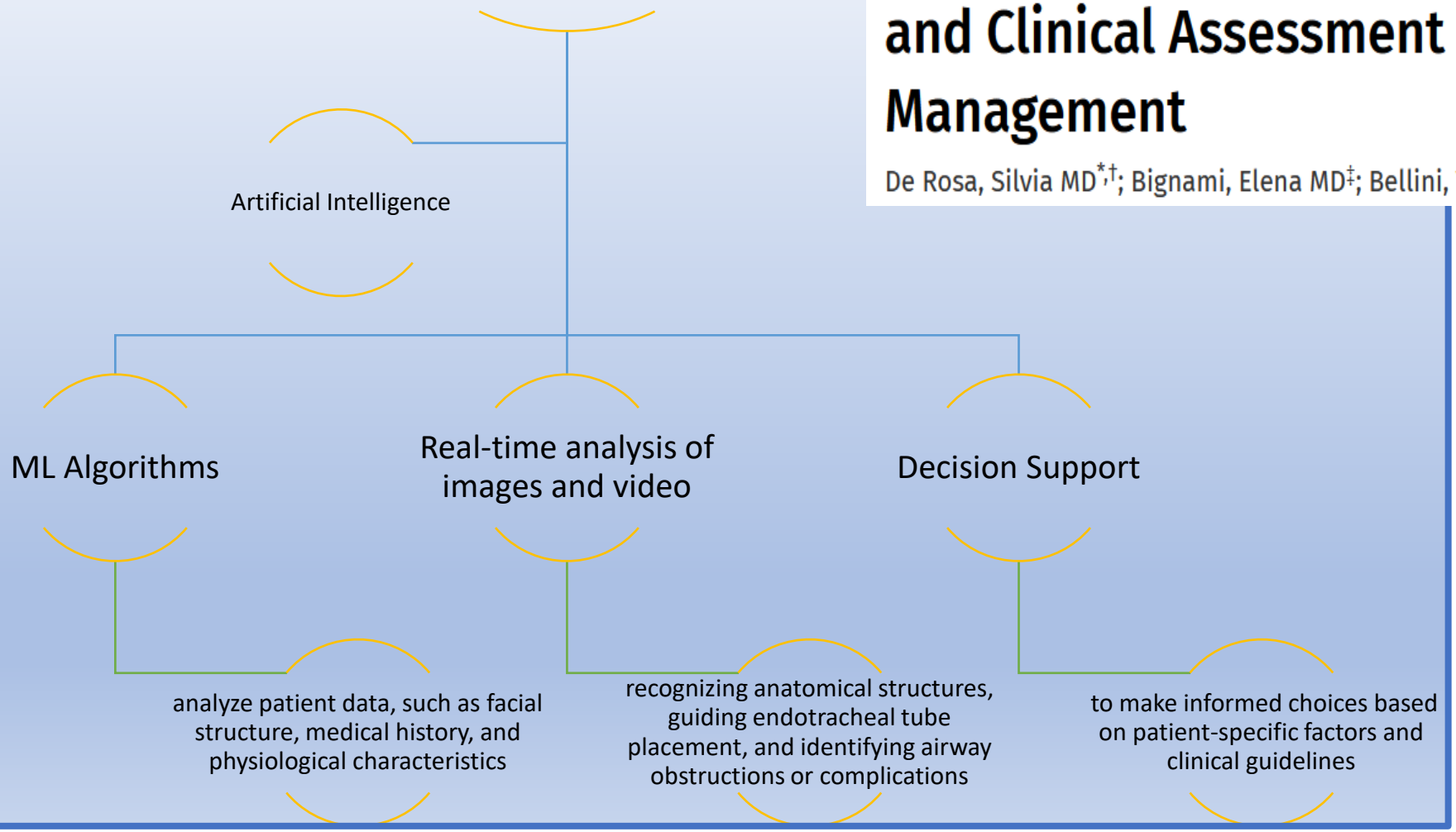
Thomas Heidegger, MD, DESA, FEAMS,*† Amina Ghulam, MD,* Markus Bischoff, DESA, EDIC, MSc,* and Markus M Luedi, MD, MBA†‡

…"everything that can be automated will or should be automated" is not yet decided….

OPEN PROBLEMS

- ***TIME CRITICAL TASK***
- ***SKILL BASED ACTIVITY***

Prediction of difficult airways

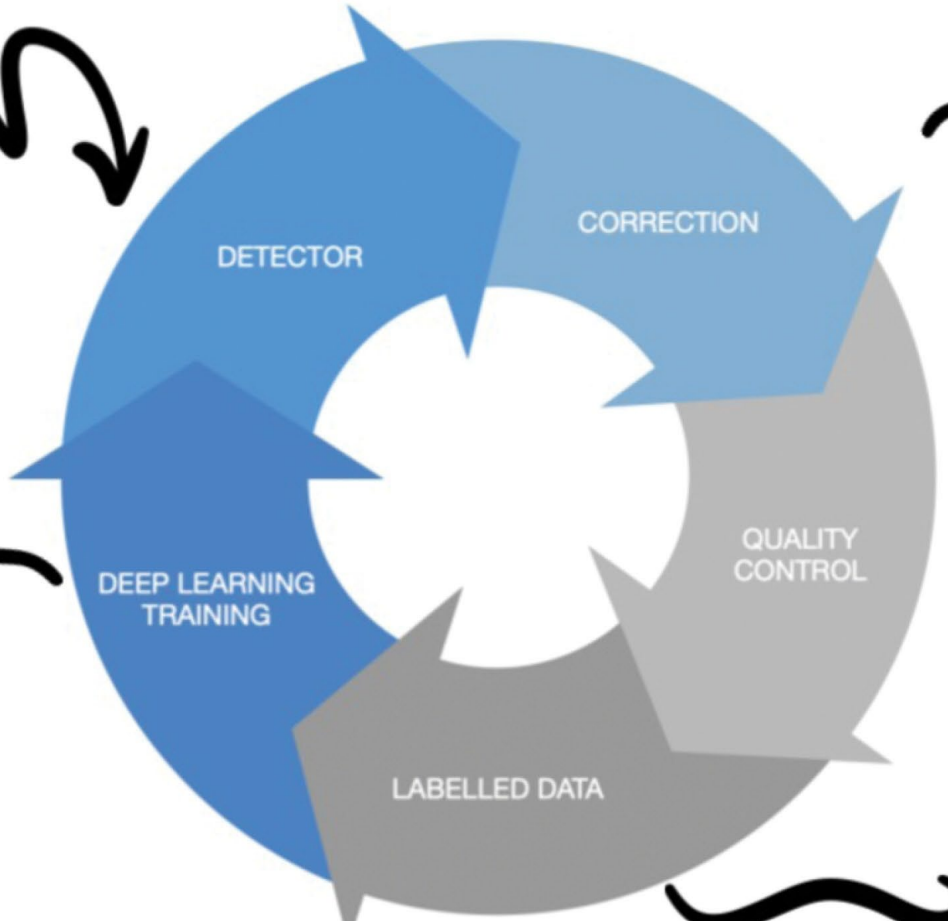


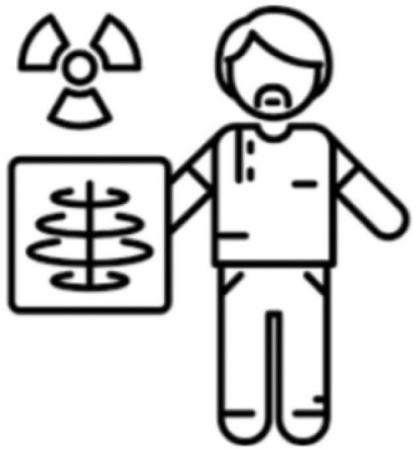
AIRWAY MANAGEMENT

The Future of Artificial Intelligence Using Images and Clinical Assessment for Difficult Airway Management

De Rosa, Silvia MD[*,†]; Bignami, Elena MD[‡]; Bellini, Valentina MD[‡]; Battaglini, Denise MD, PhD[§]

Deep Learning Segmentation Workflow





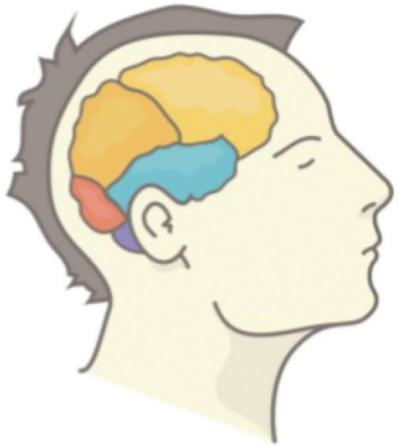
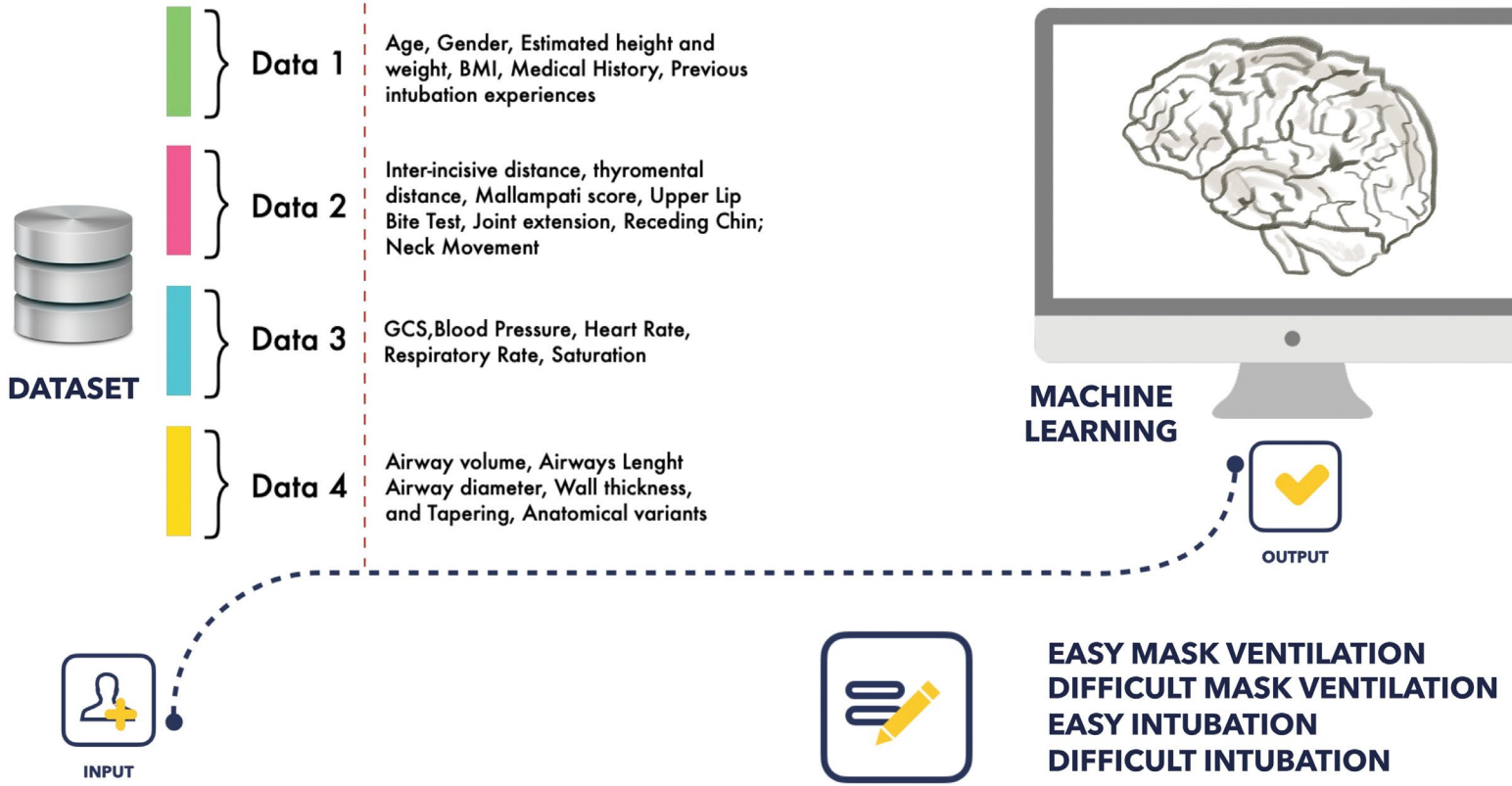


Figure 2.

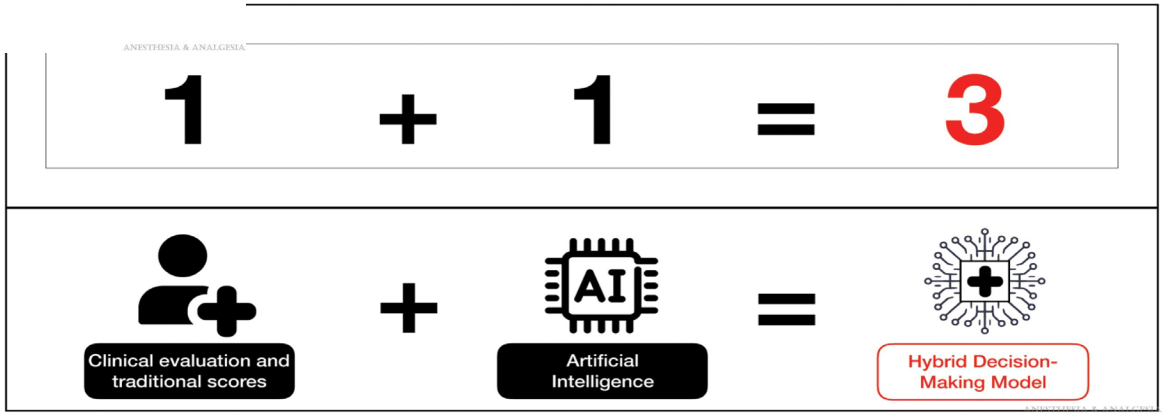


The Future of Artificial Intelligence Using Images and Clinical Assessment for Difficult Airway Management

De Rosa, Silvia; Bignami, Elena; Bellini, Valentina; Battaglini, Denise

Anesthesia & Analgesia : April 01, 2024

doi: 10.1213/ANE.0000000000006969

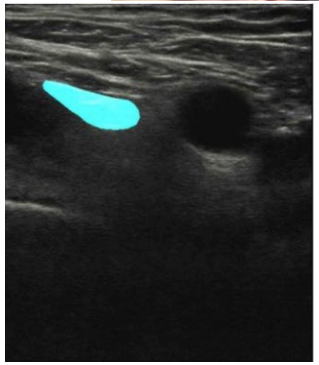


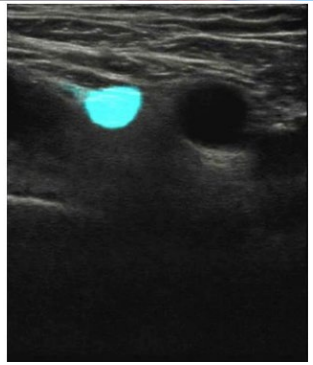
Review

Artificial Intelligence-Supported Ultrasonography in Anesthesiology: Evaluation of a Patient in the Operating Theatre

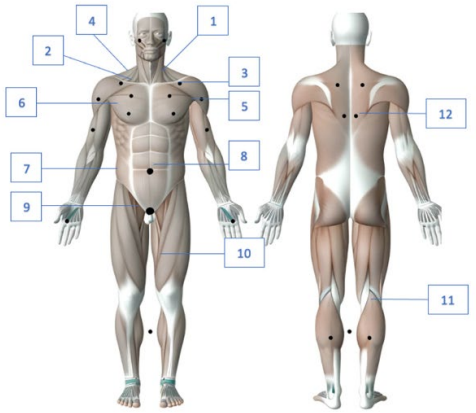
Sławomir Mika [1,*], Wojciech Gola [2], Monika Gil-Mika [3], Mateusz Wilk [4] and Hanna Misiołek [5]

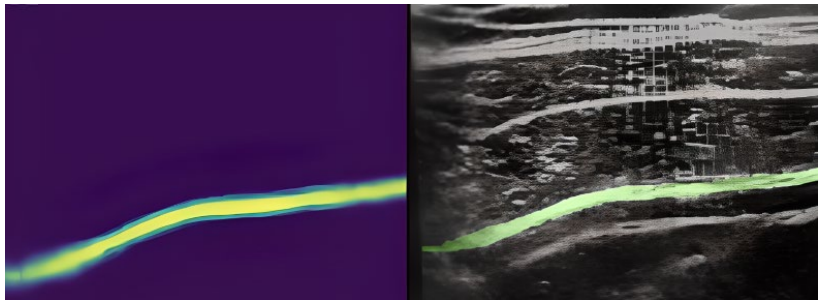
Diversi esempi di software già disponibili per il Mercato

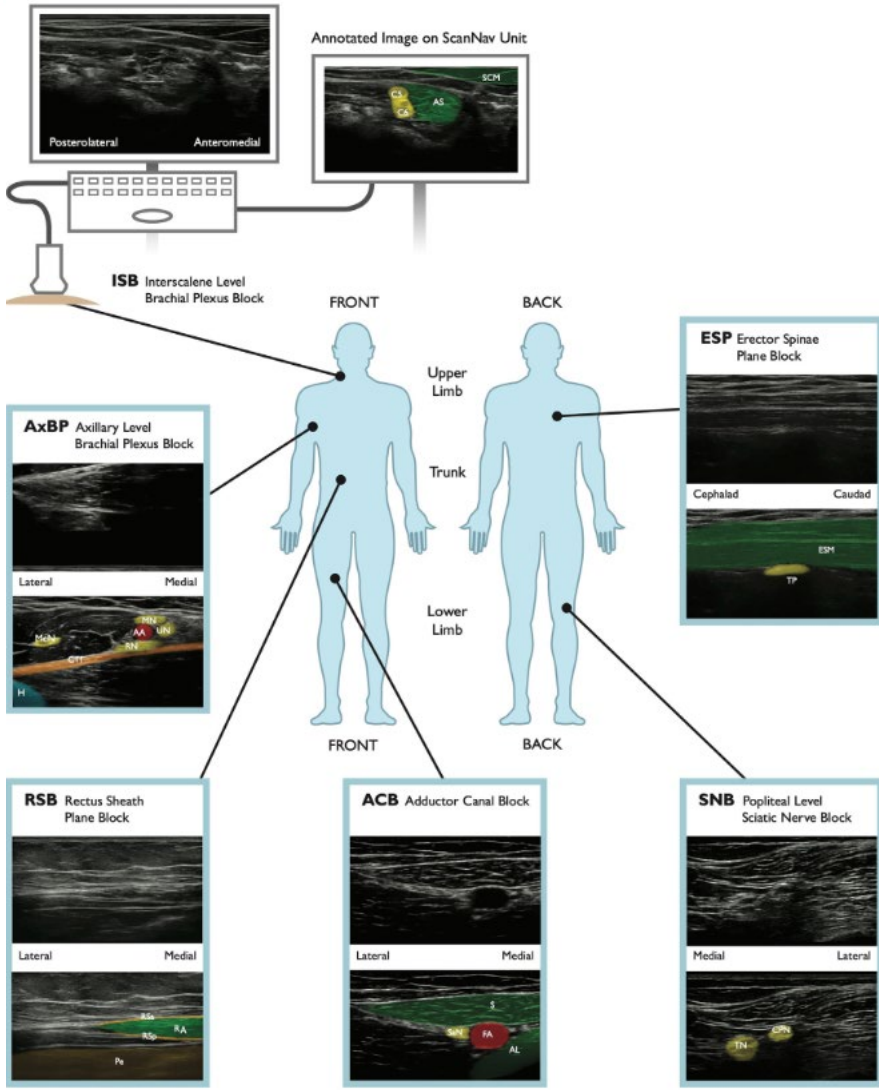




1. Interscalene Brachial Plexus
2. Supraclavicular Brachial Plexus
3. Infraclavicular Brachial Plexus
4. Superficial Cervical Plexus
5. Axillary Brachial Plexus
6. PECS I & II
7. Transversus Abdominis Plane (TAP)
8. Rectus Sheath
9. Femoral
10. Saphenous (Adductor Canal)
11. Popliteal Sciatic
12. Erector Spinae Plane (ESP)







Evaluation of the impact of assistive artificial intelligence on ultrasound scanning for regional anaesthesia

James S. Bowness[1,2,*], Alan J. R. Macfarlane[3,4], David Burckett-St Laurent[5], Catherine Harris[2], Steve Margetts[6], Megan Morecroft[6], David Phillips[2], Tom Rees[2], Nick Sleep[6], Asta Vasalauskaite[6], Simeon West[7], J. Alison Noble[8] and Helen Higham[1,9]

..Use of an assistive AI device was associated with improved ultrasound image acquisition and interpretation. Such technology holds potential to augment performance of ultrasound scanning for regional anaesthesia by non-experts, potentially expanding patient access to these techniques..

REGIONAL ANAESTHESIA – EDUCATION AND ARTIFICIAL INTELLIGENCE

Variability between human experts and artificial intelligence in identification of anatomical structures by ultrasound in regional anaesthesia: a framework for evaluation of assistive artificial intelligence

James S. Bowness[1,2,*], Robert Morse[3], Owen Lewis[2], James Lloyd[2], David Burckett-St Laurent[4], Boyne Bellew[5,6], Alan J. R. Macfarlane[7,8], Amit Pawa[9,10], Alasdair Taylor[11], J. Alison Noble[12] and Helen Higham[1,13]

"..human experts and the AI system both showed the same pattern of agreement in sono-anatomical structure identification…
….Anaesthetists should be actively engaged in the development and adoption of new AI technology"

SISTEMI INDOSSABILI

Wearable wireless continuous vital signs monitoring on the general ward

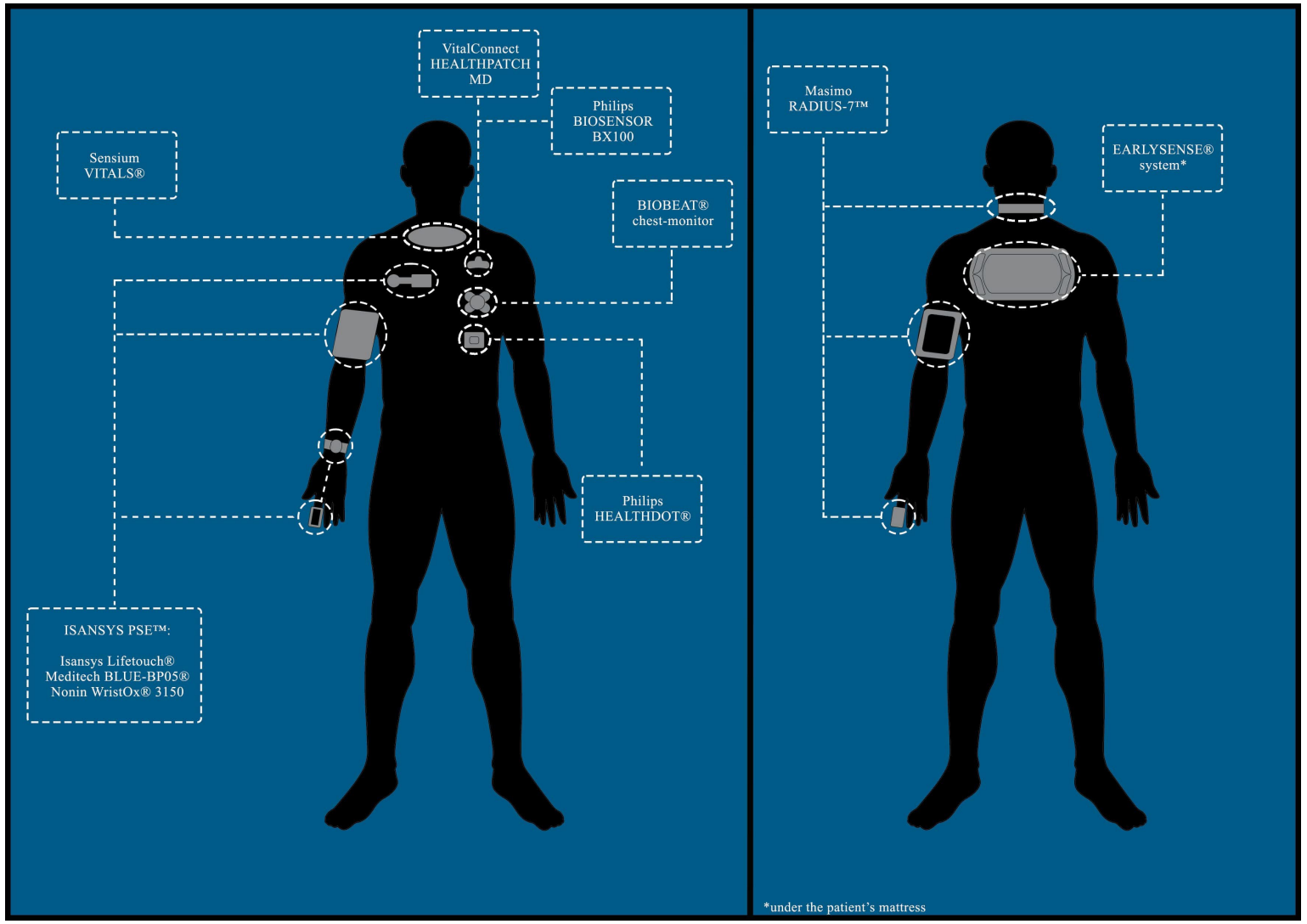
Jobbe PL. Leenen[a,b], Lisette Schoonhoven[c,d] and Gijs A. Patijn[a,e]

I sensori e i dispositivi includono tipicamente cerotti, braccialetti o altri piccoli dispositivi che possono essere indossati comodamente dai pazienti.
Utilizzano vari sensori per catturare continuamente i dati relative ai parametri vitali.

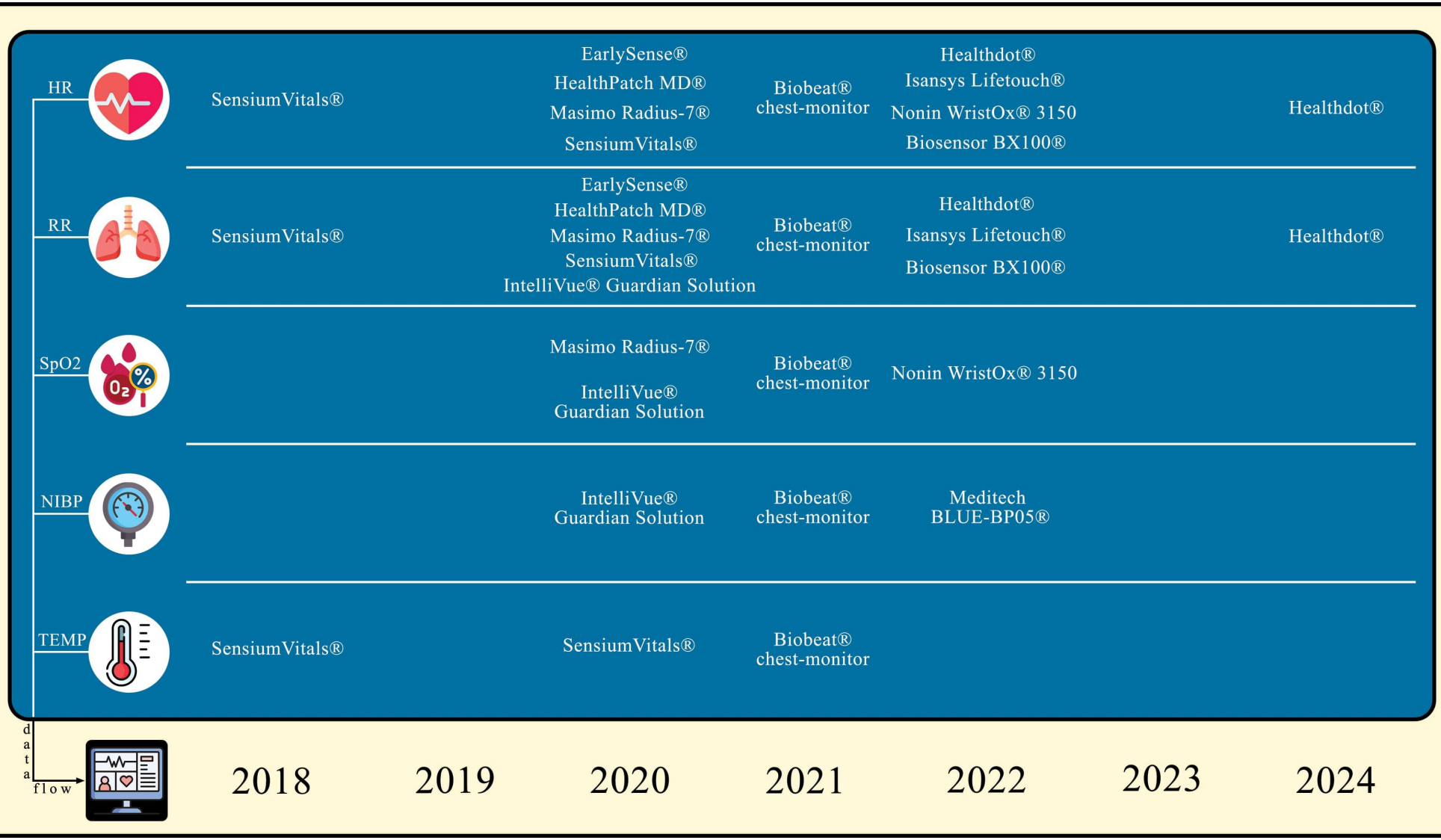
I sensori wireless indossabili per il monitoraggio continuo dei segni vitali (CVSM) offrono il potenziale per l'identificazione precoce del deterioramento del paziente

→

Impatto sugli esiti: riduzione dei ricoveri in terapia intensiva, delle complicanze, della mortalità e della durata della degenza dei pazienti ricoverati.



Bignami et al. *Journal of Clinical Monitoring and Computing*.
ACCEPTED 2024



Bignami et al. *Journal of Clinical Monitoring and Computing*
ACCEPTED 2024

UNIVERSITÀ DI PARMA
DIPARTIMENTO DI MEDICINA E CHIRURGIA

Protocollo di studio

"Real-time Evaluation and Continuous Observation of Vital signs for Enhanced Recovery (RECOVER) "

2 gruppi: **gold standard**
vs monitoraggio
Con sistemi indossabili

- *Numero eventi* **desaturazione**
- *Numero eventi di* ***tachipnea***
- *Numero eventi di* ***instabilità emodinamica***

Endpoints secondari

- Tasso di falsi positivi
- Numero di attivazioni del medico di guardia
- Numero di richieste di consulenza rianimatoria
- Ammissione diretta in Terapia Intensiva dal Comparto operatorio non programmata
- Trasferimento in Terapia Intensiva durante il periodo post-operatorio (dal reparto di Degenza)
- Insorgenza di complicanze post-chirurgiche
- Reintervento
- Correlazione tra il trend dei parametri, compresa la persistente deviazione dai valori preoperatori, e l'outcome
- Durata della degenza ospedaliera
- Ostacoli alla riabilitazione dei pazienti
- Soddisfazione del paziente
- Integrazione del sistema di monitoraggio in continuo con il sistema IT aziendale

IMPLEMENTAZIONE CLINICA

- ✓ Integrazione con i sistemi informativi locali
- ✓ Analisi costi/benefici
- ✓ Mantenere la paternità dei dati
- ✓ Approfondire le tipologie esistenti per individuare quelle maggiormente conformi alle nostre esigenze

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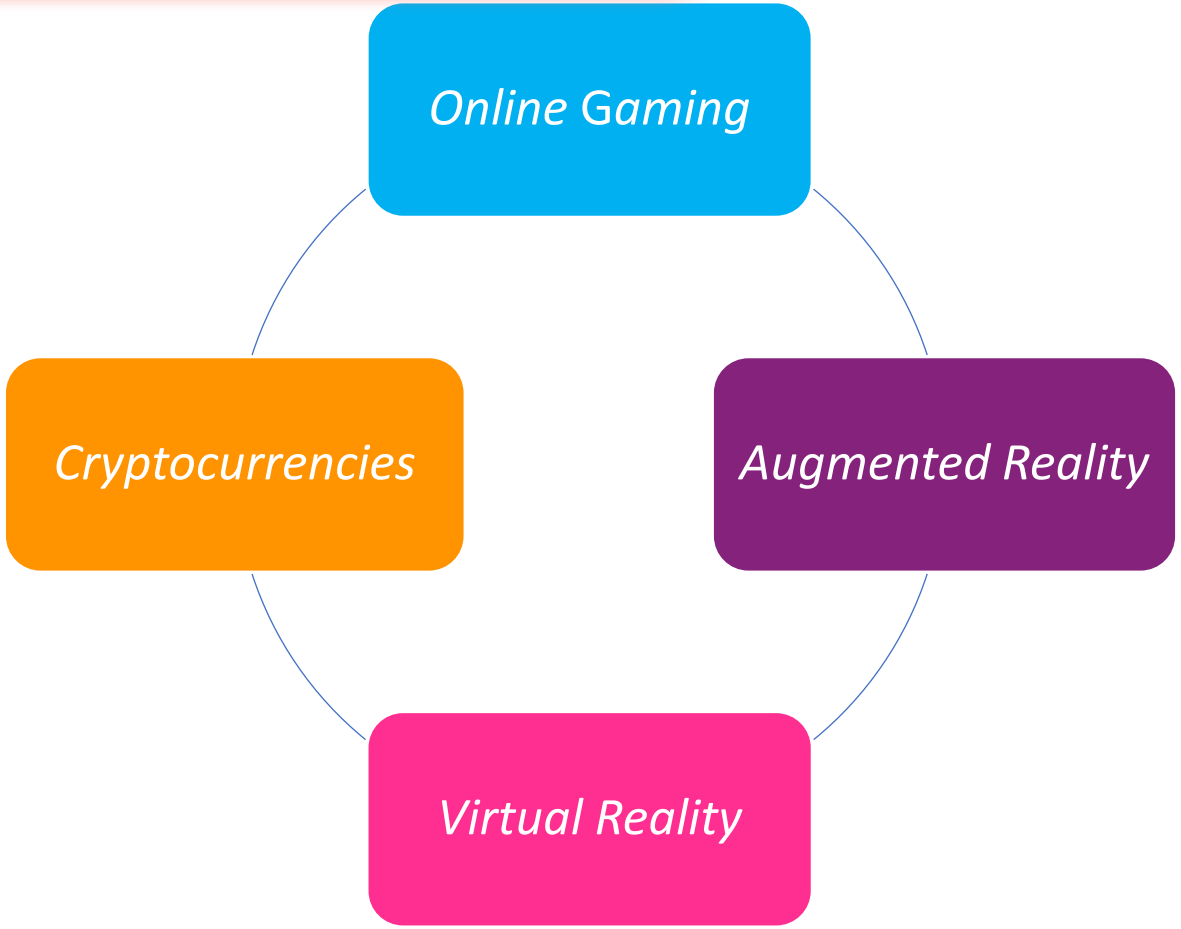
METAVERSO



"Un metaverso è uno spazio collettivo virtuale condiviso, creato dalla convergenza di realtà fisiche e digitali potenziate virtualmente".

Bellini, Bignami et al.
ANESTHESIA&ANALGESIA.
2024

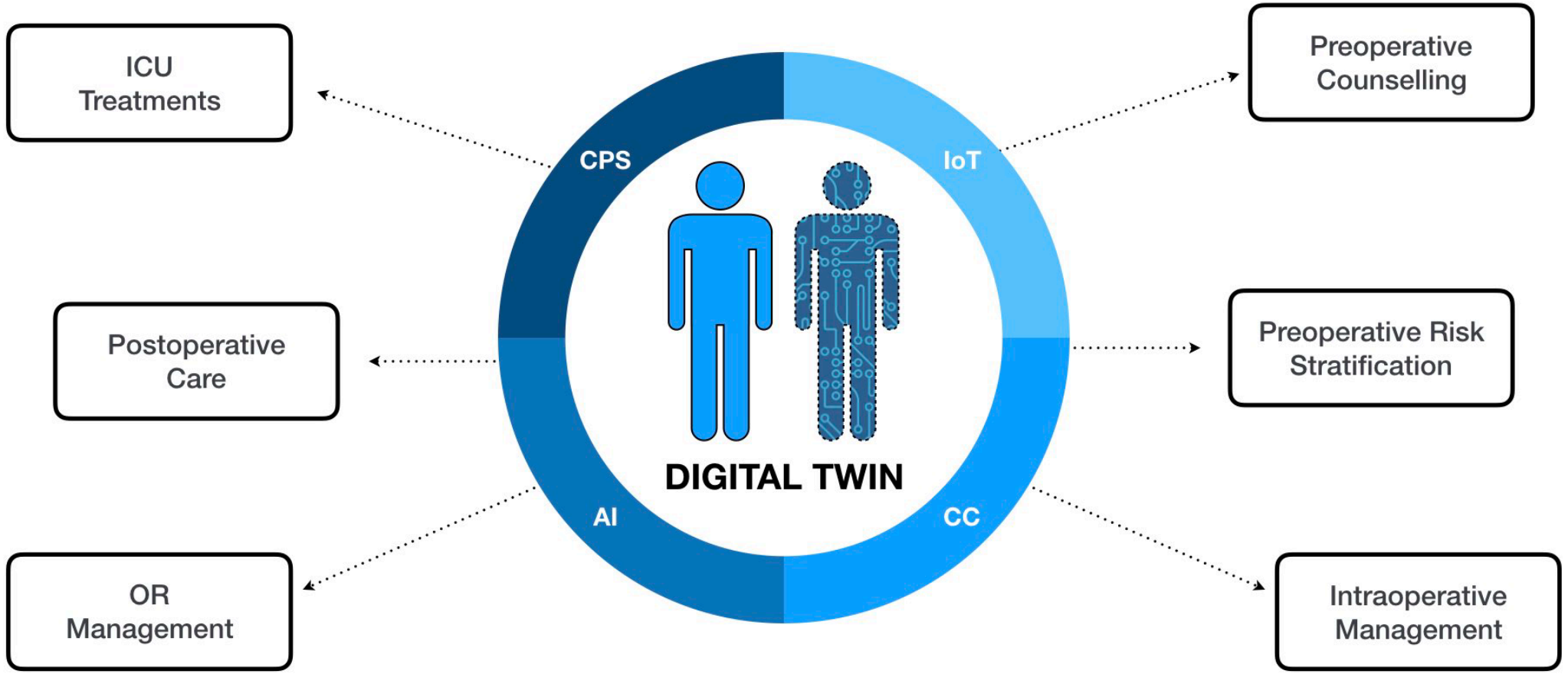
Meta-anesthesia

” l'adozione del metaverso da parte dell'anestesiologia, comprese tutte le possibili applicazioni in quest'area scientifica e le sfide che ne derivano “

Bellini, Bignami et al. *ANESTHESIA&ANALGESIA*. 2024

Figure 1. Main fields of metaverse applications in anesthesia are represented. Applications are presented in order of the amount of literature evidence.

Bellini, Bignami et al. *ANESTHESIA&ANALGESIA*. 2024

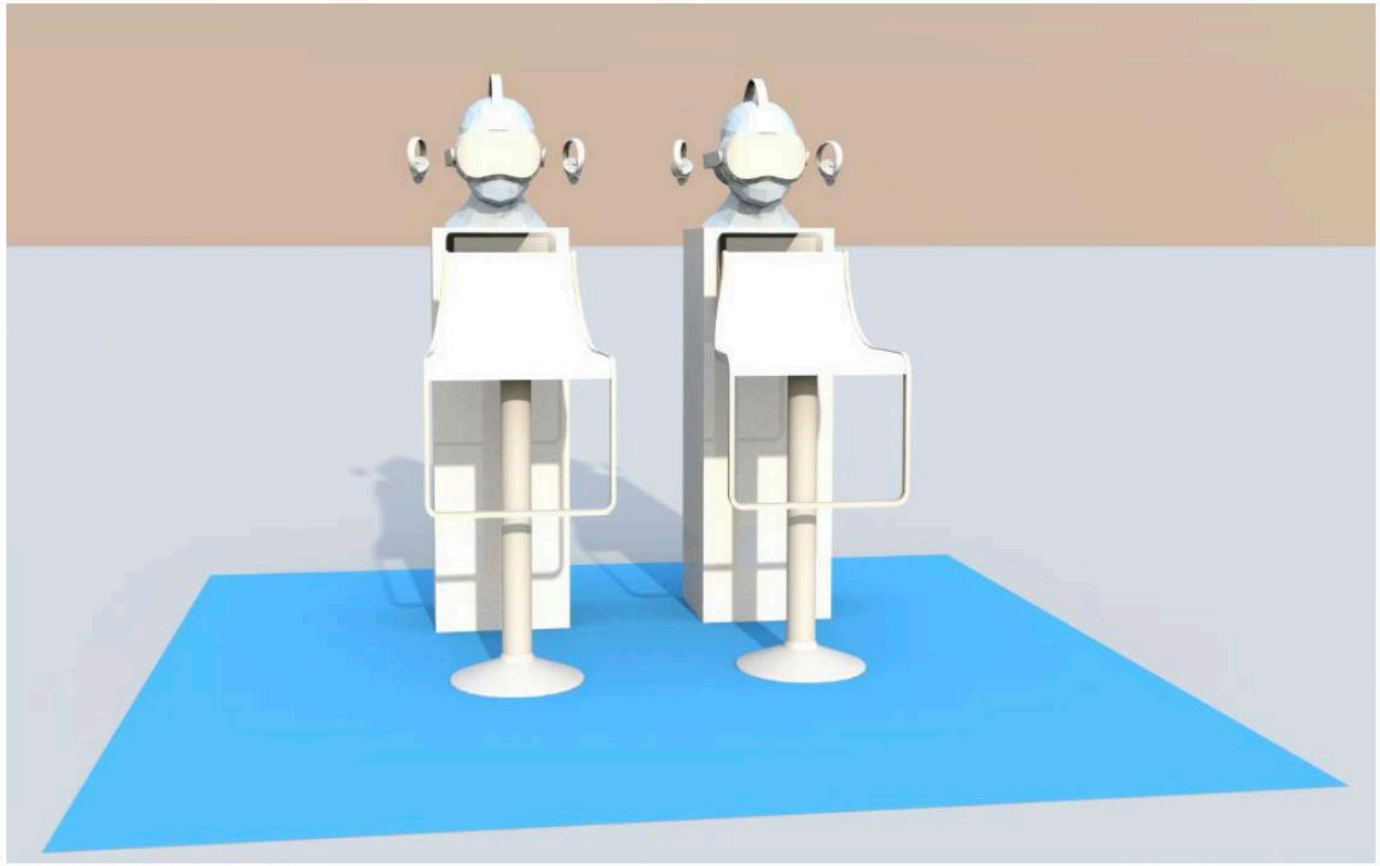


Il gemello digitale è definito come una rappresentazione digitale di un'entità o di un sistema reali

Bellini, Bignami et al. *ANESTHESIA&ANALGESIA*. 2024

Progetto “INSIEME”

PARMAI PERIOPERATIVE MEDICINE

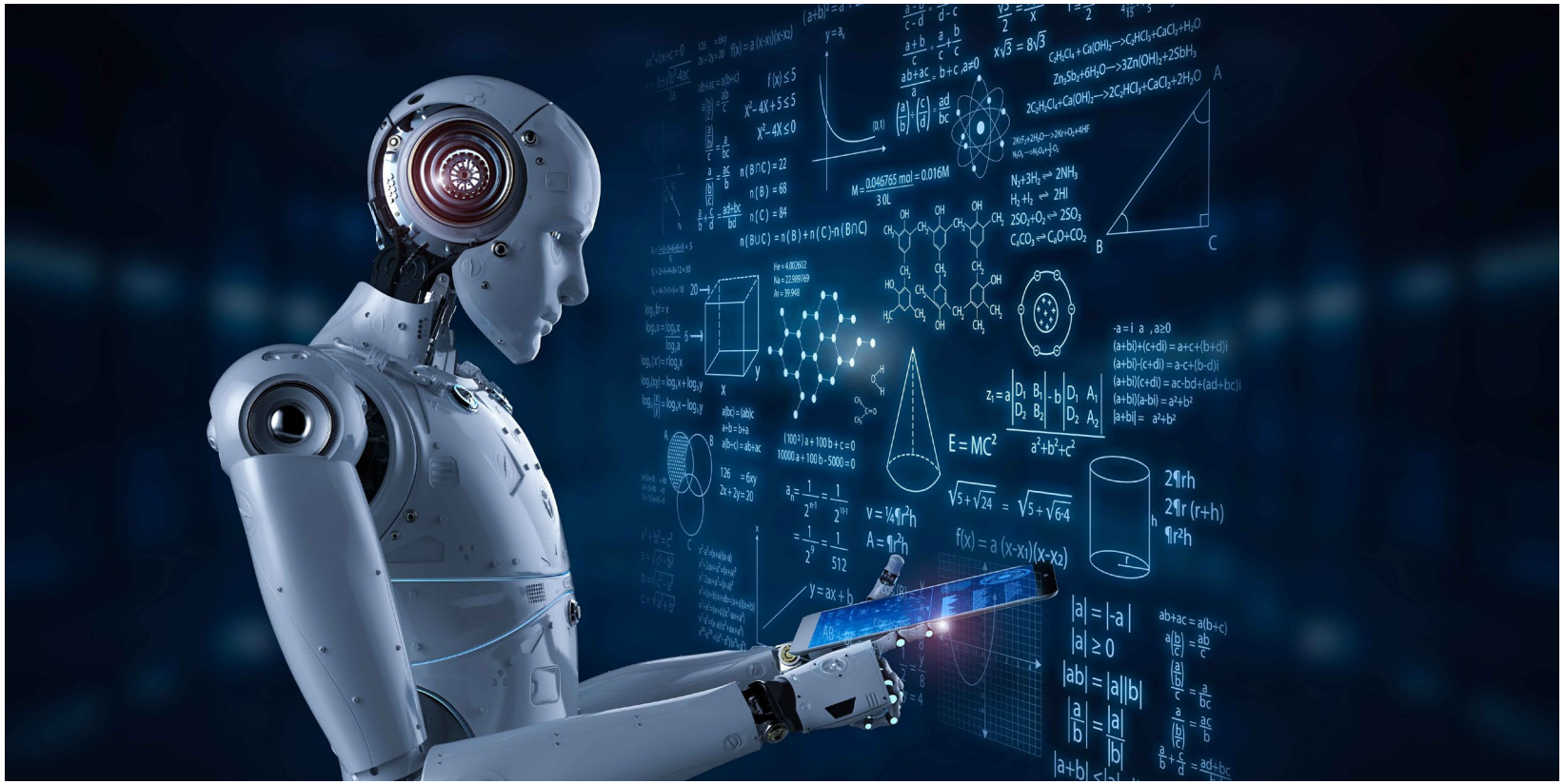


Creazione di una esperienza immersiva che guida il paziente in un tour virtuale dell’intero comparto operatorio, permettendogli di esplorare l'ambiente, conoscere il team che lo avrà in cura e ricevere una panoramica delle procedure, chirurgiche e non, cui sarà sottoposto.

- ✓ La creazione di gemelli digitali di ospedali/reparti potrebbe essere fondamentale per creare scenari di flusso di lavoro paralleli per ottimizzare le risorse disponibili.

- ✓ Inoltre, i gemelli digitali consentirebbero simulazioni accurate di diversi schemi organizzativi per arrivare a quello ottimale, evitando così tentativi nella vita reale che potrebbero compromettere la qualità del servizio offerto.

ROBOTICA



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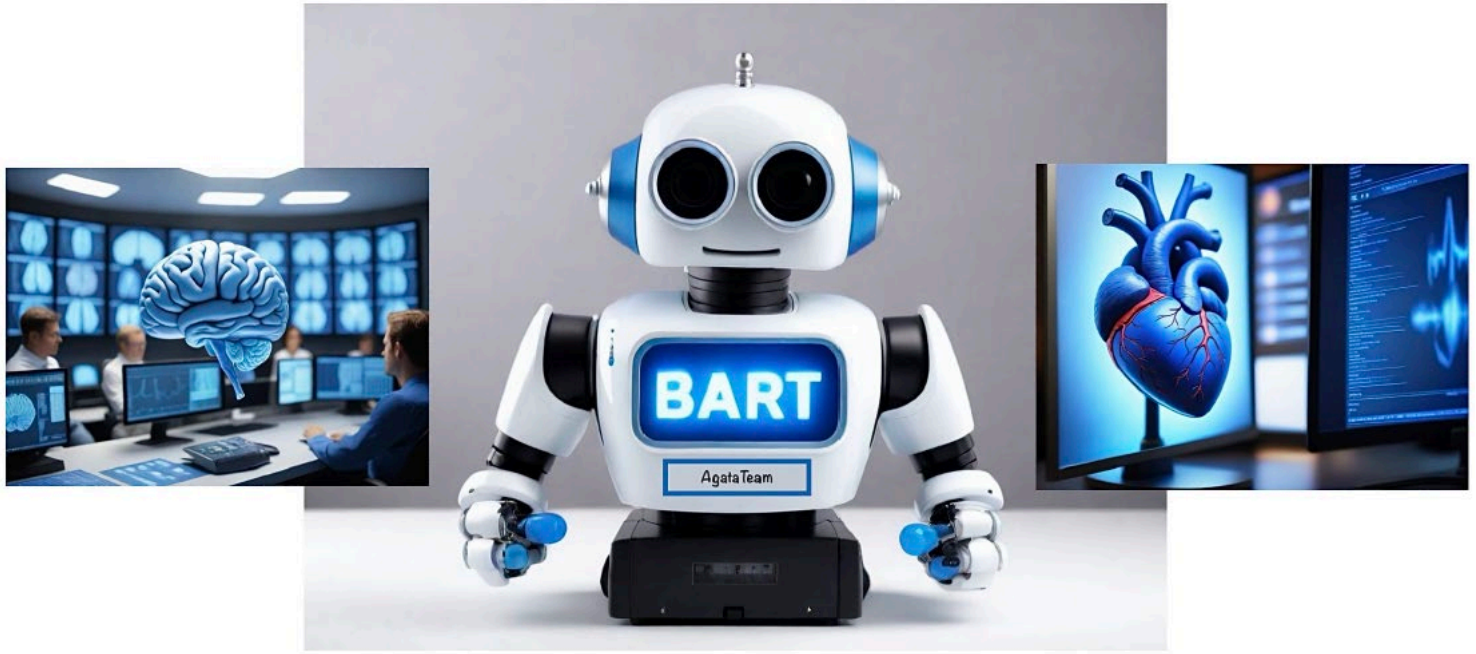
INMP National Institute for Health, Migration and Poverty
WHO Collaborating Center on Health and Migration Evidence and Capacity Building

UNIVERSITÀ DI PARMA

SAPIENZA UNIVERSITÀ DI ROMA

SISTEMA SANITARIO REGIONALE
IRCCS LAZZARO SPALLANZANI

Bocci, Bignami et al. *J Anesth Analg Crit Care*. 2024



CHEST with touch screen monitor for real time bilateral interaction between doctor and patient.
ABDOMEN with drawer that can be opened remotely to provide the patient with drugs, meal and other materials.
ELEVATING BASE with wheels that allow stability and 360° movement and cameras for monitoring drainage and diuresis.

HEAD with 360° rotation function to be able to explore the entire environment.
EYES with high resolution cameras to be able to capture every detail of the patient in real time, providing high quality visual information to the control room.
EARS equipped with highly sensitive microphones to collect sound signals and interact with the patient remotely.
MOUTH with speaker to facilitate contactless communication between the control room and the patient.
AERIAL with different technologies (wifi, bluetooth, blockchain) to acquire data from the monitors and the patient.
MECHANICAL ARMS with independent movement and thermal sensors.
HANDS with knob rotation and button pressing functions.

PRINCIAPALI SFIDE E LIMITI

1) ADEGUATA QUALITA DEI DATI
2) INTERAZIONE MEDICO E NUOVE TECNOLOGIE
3) GESTIONE DEGLI ASPETTI ETICI E LEGALI

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Privacy-preserving artificial intelligence in healthcare: Techniques and applications

Nazish Khalid [a], Adnan Qayyum [a], Muhammad Bilal [b], Ala Al-Fuqaha [c], Junaid Qadir [d,*]

bioethics

ORIGINAL ARTICLE | Open Access

Artificial intelligence and the doctor–patient relationship expanding the paradigm of shared decision making

Giorgia Lorenzini, Laura Arbelaez Ossa, David Martin Shaw, Bernice Simone Elger

First published: 25 March 2023 | https://doi.org/10.1111/bioe.13158 | Citations: 1

Intensive Care Med
https://doi.org/10.1007/s00134-021-06473-4

CORRESPONDENCE

Poor quality data, privacy, lack of certifications: the lethal triad of new technologies in intensive care

Valentina Bellini[1], Jonathan Montomoli[2] and Elena Bignami[1*]

Ethics Principles for Artificial Intelligence–Based Telemedicine for Public Health

Simona Tiribelli PhD, **Annabelle Monnot** MSc, **Syed F. H. Shah** BA, MB BChir, **Anmol Arora** MB BChir, **Ping J. Toong** , and **Sokanha Kong** MPhil

[+] Author affiliations, information, and correspondence details

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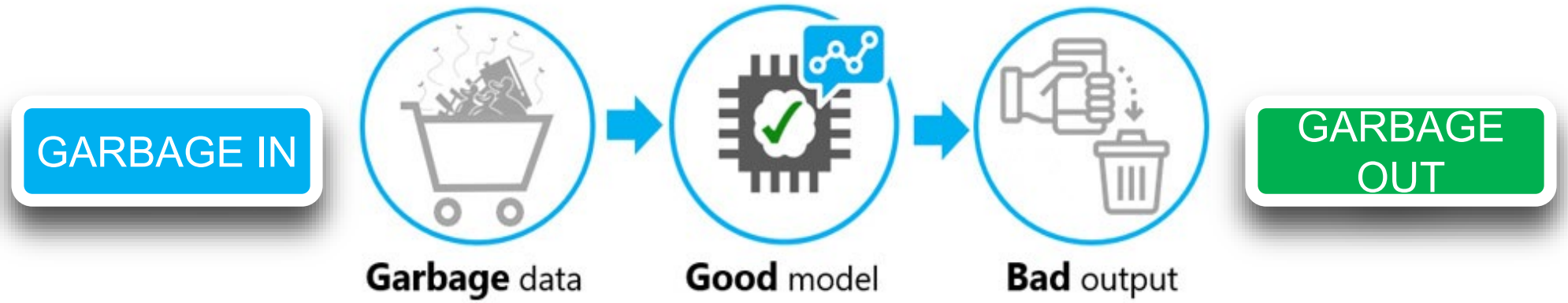
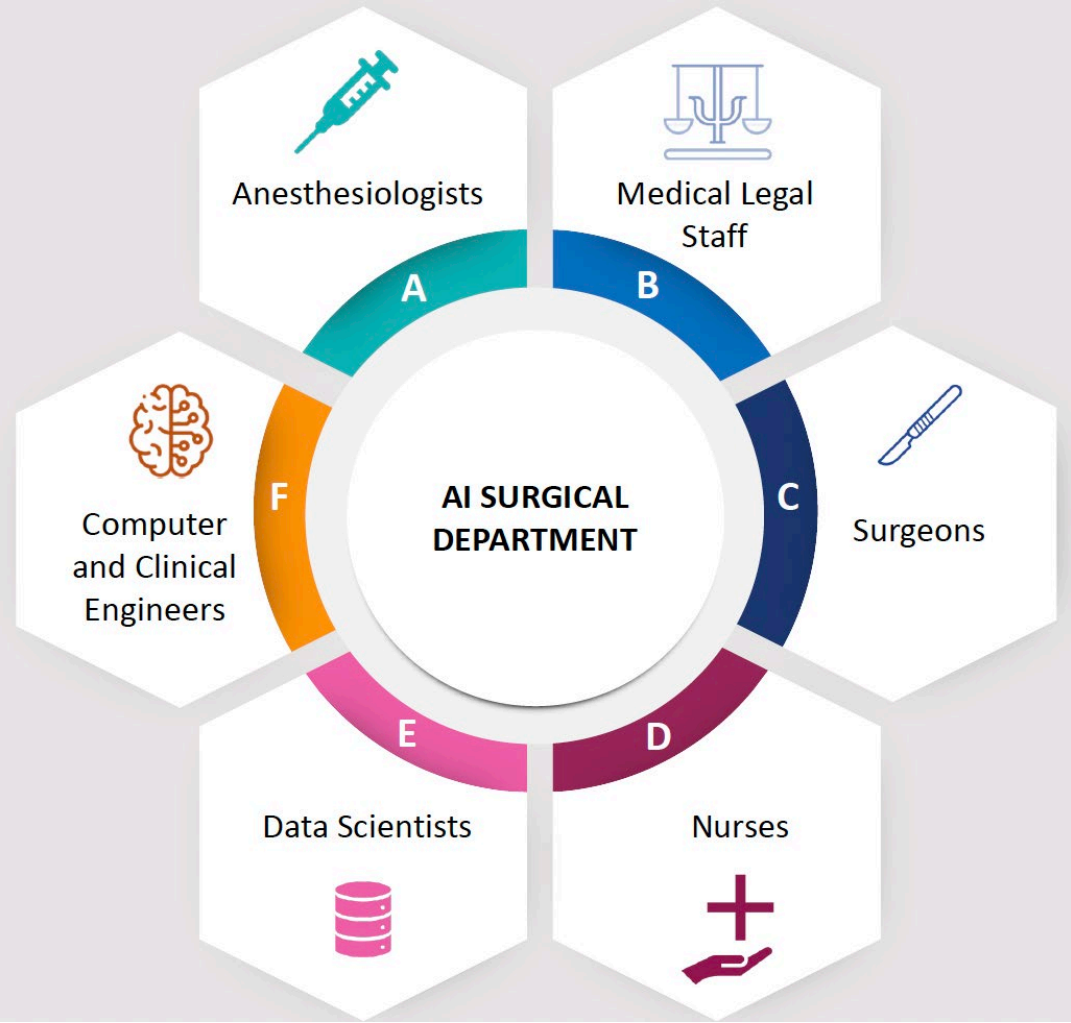
GIGO RULE

«Le performance di queste tecnologie dipendono dalla qualità dei dati secondo la regola GIGO dell'informatica»




Anesthesiologists
Medical Legal Staff
A
B
C
F
AI SURGICAL DEPARTMENT
Computer and Clinical Engineers
Surgeons
E
D
Data Scientists
Nurses

The power of evolution cannot be contained, so let it be

Marco CASCELLA [1], Valentina BELLINI [2], Jonathan MONTOMOLI [3], Elena BIGNAMI [2] *

Minerva Anestesiologica 2023 mese;89(0):000–000
DOI: 10.23736/S0375-9393.23.17484-0

... «AI&NT will not replace anesthesiologist.

However, those anesthesiologist that use AI&NT will replace those that don't»