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Introduction

In an Intensive Care Unit (ICU), we attend people with a wide range of pathologies. All the information obtained from monitoring our critical patients, diagnostic and therapeutic techniques, responses to treatments, action plans, etc. is the greatest asset that a professional has available to carry out and optimise his work and that of his colleagues and patient's prognosis in a high-risk environment.

The transmission of information (TOI) among the ICU team members is a 'soft skill' that is applied by different types of professionals and is fundamental for the continuous 24/7 care of critical patients. It is called handoff or handover communi-

Information Transfer as a Strategy to Improve Safety in ICU

The transmission of information (TOI) in extremely variable environments, such as the ICU, is crucial. The content and how it is transmitted can be decisive in the safe care of the critical patient.

cation, but we prefer to employ the term TOI because an integrative communication is not only important for the efficiency of the attending healthcare team, but also for health communication with the critical patient and their family. It has also been shown to increase the objective quality (prognosis at discharge) and perceived quality by the patient. Adequate TOI, like any other tool or technique, requires training to be performed in a professional manner and is essential for the safe care of the critical patient.

The need to transmit information in an effective way appeared with the beginning of the first 'ICUs' in the 1950s. TOI is necessary for patient changes of location and for shift handoffs. The publication of articles about TOI in the critically ill patient began in the 1980s. The desire to innovate and improve is not a routine in the day-to-day work of an ICU, despite the intention of the ICU teams to develop patient safety protocols for the TOI process shown in studies (Häggström and Bäckström 2014; Wessman et al. 2017; Sirgo et al. 2018). Perhaps this is because there is no gold standard TOI (Da Silva et al. 2018). The multidisciplinary teams, the very different pathologies that are treated, their complexity and the local routine of each ICU all make it difficult to transition from intention to practice.

Each TOI reflects each professional's own experience. Reflecting on TOI, we can identify opportunities for learning and improvement that will help us during challenges such as the COVID-19 pandemic

(Ballesteros et al. 2020).

Objective

The objective of this article is to promote optimal transmission of information (TOI) in the care of critical patients as good clinical practice (GCP). It is part of a multidisciplinary, cross-cutting safety strategy that benefits patient outcomes, staff performance, ICU team efficiency and the organisation sustainability.

This article is not intended to be an exhaustive review of TOI tools. We consider it important to enrich our practice through various publications. This involves us in the improvement of healthcare through learning that is applicable in the day-to-day life of the entire ICU team, with each other and with patients and their families.

Adequate TOI Enhances ICU Safety

The complexity of ICU workflow, with its cognitive, linguistic, technical, and physical demands requires a TOI protocol included in the overall strategy to increase patient safety. Secure handoff communication promotes adequate continuity of care.

ICUSRS, SEE, ENEAS, IDEA, SYREC* study (Merino et al. 2007) and studies already well known (Pronovost et al. 2006) show that inadequate communication can be behind any type of incident due to [according to International Classification for Patient Safety (ICPS)]: ambiguous verbal orders or comprehension problems related to lack of education or training. National Patient

*ICUSRS - ICU Incident Safety Reporting System; SEE - Sentinel Events Evaluation; ENEAS - National Hospitalization-Linked Adverse Event Study; IDEA - Project for the Identification of Adverse Effects; SYREC Study of incidents and adverse events in Intensive Care Medicine.

Safety Agency (NPSA) suggests that with proper TOI training, these incidents would be avoidable (Rhudy 2019). By avoiding them, we would maximise the safety of patient reported experience (PREMS) and patient reported outcome measure (PROMS) (Sirgo et al. 2021). The residents themselves have published that inadequate shift handoffs (Rattray et al. 2018) can lead to delays and duplications in diagnostic and therapeutic tests, greater patient discomfort, inappropriate care, poorer team performance, medication errors, failures in patient follow-up and longer stays.

The Joint Commission (The Joint Commission 2021) recommends the development of 'structured procedures' for communication by adopting eQMs (electronic clinical quality measures) and HIT (Health Information Technology) driven quality improvement practices. The goal of Patient Safety Systems (PS) is to redesign a patient-centred system

the information transmitted is accurate, appropriate, directed to the right person and it recommended the implementation of structured communication techniques (Sirgo et al. 2018).

Characteristics With Greater Safety Risk in the ICU and Benefit from Adequate TOI

- **Transfers:** With every change of location or level of care (emergency room, ward, operating room, ICU), the responsibility and person in charge is also transferred. This TOI is based on the secure, encourage, collaborate (SEC) model (Häggström and Bäckström 2014). It involves ensuring that everything is understood, personalising information by resolving doubts and maintaining the care process through pre- and post-ICU follow-up (Abella et al. 2016), especially in patients with a long stay. If the patient

adequately or feels dependent on ICU technology or staff. Here TOI is crucial to optimise the chain of care and avoid readmissions to the ICU. Temporary TOI (changes of medical shift, nursing shift, transfer of a patient for a diagnostic or therapeutic technique) is very frequent and, therefore, it is important to reduce risks with an adequate TOI.

- **Patient-dependent:** age, date and time of admission and discharge, readmission, pathology (Calleja et al. 2020), specialties involved (Puzio et al. 2020), time-dependent diseases, etc.
- **Dependent on the type of hospital:** number of beds (hospital and ICU), type of ICU, number of admissions/years, nurse/patient, and doctor/patient ratio, nine equivalents of nursing manpower user score (NEMS), inadequate supervision, unplanned processes, lack of risk assessment and lack of solutions for known problems.
- **Dependent on the roles of the people performing the TOI:** Must be individualised. Depending on the transmitter and receiver of the information, both the content, context, and the way of transmitting it may not be the same. It can be divided into:
 - o **Intradisciplinary TOI:** consultants to consultants, residents to residents, nurses to nurses.
 - o **Interdisciplinary TOI:** consultants to nurses, residents to nurses, consultants to residents, ICU staff to specialists outside the ICU, all of them to the patients and all of them to the families (Bressan et al. 2019; Loeffgren and Anderzén-Carlsson 2020).

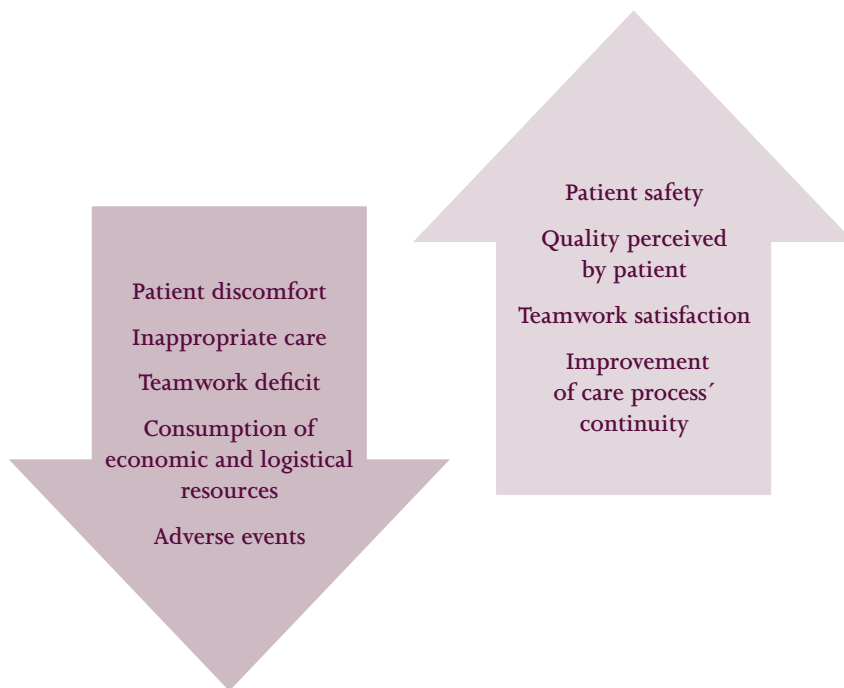


Figure 1. Expected results after implementation of adequate TOI protocol

that improves quality of care and patient safety. The Patient Health Strategy of the National Health System 2015-20 (Estrategia de Salud del Paciente del Sistema Nacional de Salud 2015) promoted communication between professionals to ensure that

is discharged from the ICU, it requires greater organisation before, during and after the transfer. It is because the patient leaves a highly technical unit (Häggström and Bäckström 2014) or the patient is not able to communicate

What Constitutes Adequate TOI?

Initially the TOI studies were retrospective analyses, then prospective observational and pre- and post-intervention studies, protocols as SNAPPI, infinite checklist, or a mnemonic rule for example SBAR (Abassazde 2021), HAND-IT, and SOAP* Experiential descriptive studies (Häggström

SNAPPI - Stop, Notify, Assessment, Plan, Prioritise, Invite; SBAR - Situation, Background, Assessment, Recommendation; HAND-IT - Handoff information tool; SOAP - Subjective, Objective, Assessment, Plan.

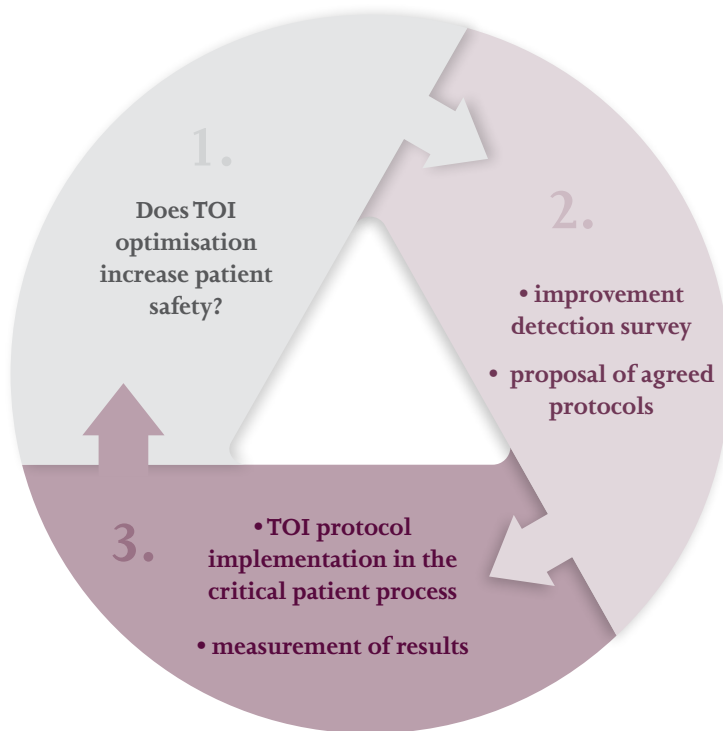


Figure 2. TOI optimisation process

and Bäckström 2014) have been carried out (based on qualitative content surveys) to the staff working in an ICU, to patients admitted to the ICU and their families. The studies have focused on looking for factors contributing to better TOI, methods to solve the problems encountered and their effects on critically ill patient safety risks (Da Silva 2018) and healthcare services (Raeisi et al. 2019). They found incomplete or incorrect information in the handoff caused by lack of standardisation and TOI preparation, which generated incorrect procedures, or their delay or non-performance. The use of tools reduced both omitted information and errors, improving team satisfaction.

Previous publications emphasised the use of checklist to avoid omissions. Omissions decreased by 21% in the handoffs and transitions in critical care (HATRICC) study (Lane-Fall et al. 2020). The more protocol steps were followed, the less information omissions occurred. This did not lead to changes in days of stay or mortality and did increase the duration of TOI. Have we reached the ceiling for improvement in patient safety and outcomes? Have we overlooked any TOI deficits that have not been resolved? (Fleming et al. 2016). Perhaps we have yet to define what good TOI is

(Nasarwanji et al. 2016), both its content and its context (Lane-Fall et al. 2020).

The TOI in an ICU is a very complex social interaction. They have the purpose of providing 24/7 patient care. TOI allows effective communication between professionals who work together frequently or not. That handover of information is 'care' offered to the critically ill patient. It is not only about data. It also implies a handover of inter and intradisciplinary responsibility within the care team. An adequate TOI minimises risks in the continuum of care by reducing failures and optimising clinical care and prognosis (Alexander 2021).

The objective of TOI is operational, oriented to anticipating problems and strategic planning for the patient, and intrinsically formative. In the real-world of our ICUs, TOI must be customised. It always has three components: place, time, and people. All of them are facilitators. The period in which TOI takes place defines the people, spaces, and content of TOI. Although an ICU involves continuous care, most of it occurs in the morning hours. During this period, techniques, programmed interventions, consultation of other specialties, resident rotations, and most admissions (early detection of patients

at risk) are performed (Abella et al. 2013). This schedule differs on weekends in that the end-of-morning duty clinical round is not usually performed. On those days, team huddles (if any) are used.

How to Determine TOI in the ICU is Adequate?

Initially, different ICU's chose to use various checklists. More than 20 mnemonic rules (Nassarwanji et al. 2016) have been described. These may be valid in certain contexts (Weller et al. 2014), but they can constrain TOI. In fact, rigid protocols have not been successful. TOI is now approached as a process map in which the role and responsibility of each team member is defined for each time frame and every given patient within a framework of individualised and precision medicine. The expected common goal is defined, each step is evaluated, and appropriate changes can be initiated according to the deficits detected.

TOI modes vary according to the context or time of day. For example: briefings/debriefings or team huddles of the healthcare team:

- **Briefings:** short meetings in which roles are assigned, expectations are set, and diagnostic tests to be performed or patients to be discharged or admitted are anticipated. It is essential to know if each recipient understands and assumes what has been agreed. Example: the 8:00 a.m. clinical round.
- **Debriefings:** exchange of information after the team's performance, analysing what has been done. Example: the meeting that closes the morning shift and starts the on-call period.
- **Team huddles:** maximum 15 minutes, in which each member points out the priority objectives of their patients and readjustments are made. Example: clinical rounds at shift changes followed by the debriefing part, medical to nursing clinical round at shift changes or vice versa. Also used during TOI on weekend on-calls.

TOI is also about informing patient and family, checking the understanding of what is reported (the terminology used should not be the same), resolving doubts and providing a prognostic assessment.

TOI involves building a common image of the patient with the patient, the patient's family, and the attending team. This reduces differences in criteria, prevents errors in care, provides individual and collective learning and improves perceived quality.

If more than two people interact in the TOI process, it is recommended that a professional with a transversal vision and experience in the ICU analyses issuers and receivers and manages time, the order of exposure and interruptions. This position can be performed between 8:00 a.m. and the end of the morning by a service or section chief and during shift changes from medicine to nursing by the consultant on duty.

Structure and Content for Adequate TOI

Information. It depends on what each ICU considers essential for quality care. It depends on patient factors (complexity, time of evolution) and environment. Recent literature suggests a change in the conceptualisation of TOI from being a transfer of very precise data to being not only a technical but also a highly contextualised social event (Ruiz 2020; Militello et al. 2018). Required to identify patient, pathology, and stage, framed in the global analysis of each patient.

Executive function. Practical approach in a high-pressure healthcare environment. Focused on finding consensual solutions for a quality continuum of care by uniting a shared purpose and motivation. Reach a shared multidisciplinary image of each patient.

Oral format. Concise and specific. Details can be consulted in a written clinical note. Providing visual material is appreciated: photos, videos, complementary tests or clarifying drawings with different communication technology.

TOI order. According to number of boxes, complexity, persons present.

TOI methods: Narrative, mnemonic rules, Q&A. Open questions, and feedback are fundamental. The process should be individualised. The contribution in relation to applied cognitive task analysis (ACTA)

(Militello and Hutton 1998) focused on complex tasks is noteworthy (Methangkool et al. 2019; Coiera and Tombs 1998; Fleming and Hübner 2013).

Face to face. Between transmitter and receiver, ensuring that the objectives and the person responsible for them are clear.

Algorithms in the form of deep learning. Not a specific one or a checklist. It is about having an internal learning of tools, almost automatic, that serves as a script of symptoms, explorations, technological parameters, and deductions. This makes it easier to follow the evolution of the data throughout patient care.

Innovative transmission. To support the retention of data during the on-call or shift.

Time to be spent. It depends on patient complexity, length of stay in ICU, new personnel, new technology or protocols. Time should be individualised, including relationships with the patient and family.

Wellness environment. Shared decisions, conversations and comments involving multidirectional teaching and learning, clinical rounds without fear of what people will say. Interactive and multidisciplinary.

Avoid unnecessary interruptions. Write down concerns and tasks on a sheet to transfer them to the sender after TOI.

Feasible by anyone. With or without experience, requiring only minimal training and useful for continuous learning with a positive impact as a team.

Performing TOI at the bedside. Makes it possible to access information from the environment: monitoring, special technology, being able to capture new data.

The goal is to foster on-call autonomy with the ability to make responsible and timely decisions by finding areas of improvement in each patient and performance with practices that guarantee care continuity.

How does TOI not improve? By listing long data, by reporting what is not a prob-

lem to be solved or by informing about something not worth paying attention to. With these things, we lose focus on what is important, we lose attention, and we waste time.

We have no doubt that TOI in the ICU is important. These are our TOI process improvement tips.

Decalogue premises to improve information transmission in critical patient

1. **TEAM.** Everyone must be aware of TOI process/protocol: role, content and context. Multidisciplinary scheme: Joint info handover will increase information exchange.
2. **ENVIRONMENT.** Relaxed, interactive, no hierarchical pressures, respectful, facilitating the process. Face to face, non-verbal as well as verbal language.
3. **TOI CONTENT.** Basic elements:
 - name and age
 - pathology and its singularity
 - medical record (issues from start or relevant for further evolution)
 - active health issues evolution
 - diagnostic/therapeutic techniques that may provide information
 - build an agreed plan for staff on-call
 - individualised forecast for future problems
4. Mnemonic **TOOLS** as a base to support information in the team and to avoid relevant oblivions.
5. **TRUE**, objective and individualised transmission of patient info with documentary support.
6. **TO SHARE** information transmitted to patient and family, knowing who is who in the process.
7. **FAMILY:** Using accessible language, asking for feedback of what has been informed, putting data in context and tracked evolution.
8. **TRANSMITTER:** Skilled staff with continuous IT training, able to clarify doubts and verify data to ensure info transmission in the right moment, in a pedagogical way for new starters, shift changes, residents, ...
9. A right **PLACE**, quiet, free of interruptions and non-noisy **LOCATION**.
10. A fixed **TIMETABLE**, one more ICU activity, maybe the only one that can be programmed in a fixed scheme.

improve TOI

The important thing in TOI is the message to be transmitted. This message includes three components: structure, content and who the transmitter and receiver are.

Transmission tools are cognitive aids that can increase the quality of our TOI. There is no one tool that is the best for all environments or times. We propose a framework in

which the transmitter chooses, if desired, a tool that helps the TOI with its structure.







 TIMETABLE	 SPACE	 TARGET	 EMITTER RECEIVER	 MEETING	 ORDER OF EXPOSITION OF PATIENTS
8:00 h From Monday to Friday, on-hours	Working room for shift handoffs	Handover after end of shift	Outgoing on-call intensivist - Incoming consultant, residents, and nursing supervisor	Briefing	According to box number unless medical urgency prioritises a different order
13:00 h From Monday to Friday, on-hours	Working room for shift handoffs	Clinical rounds: info shared once on-call period starts.	Consultant, residents, and patient care nursing	Debriefing + team huddles + checklist?	According to box number unless medical urgency or nursery availability prioritises a different order
13:00 h Weekend	Usual working room	Goals reshaping	Consultants +/- residents	team huddles	Patients with active problems
<1/4 15 minutes before shift changes at 8:00 a.m., 15:00 p.m. and 22:00 p.m.	Nursing control desk or patient bedside	Intradisciplinary handover from outgoing to incoming staff shift	Two consecutive shifts nurses	Debriefing + checklist	Based on patient prioritisation
>1/4 h 15 minutes after shift changes 15:00 p.m. and 22:00 p.m.	Nursing control desk or patient bedside	Interdisciplinary clinical rounds to goal setting for the shift	Consultants +/- residents and nurses of that shift	Briefing	Based on patient prioritisation
At patient admission, every morning and on demand	Patient's bedside	PATIENT	Consultants, residents, nurses, and patient	Debriefing + resolution of doubts	Based on patient prioritisation
At 12:00 a.m. on a mandatory basis, at 7:00 p.m. if there are any significant developments and, of course, on admission and discharge.	Family information room, located at the entrance of the ICU and used exclusively for this purpose and at the bedside in the patient's box.	FAMILY	Consultants +/- residents, family members present or by phone according to Covid standards	Debriefing + resolution of doubts	Based on patient prioritisation

Figure 4. What and where information is shared

Finally, it is essential to monitor the process. We can rely on satisfaction surveys on quality perceived by the healthcare team attending the patient and the patient himself. There may be barriers in this TOI optimisation process, not only to change but also to thinking about change, due to physical or mental fatigue, stress, lack of time, lack of teamwork culture, communication training or thinking that it is not important. Feedback for improvement processes with constructive conversations should culminate in solutions that can be applied in situ.

Benefits of Proactive ICU TOI Process Design for Critical Patient Safety

For the patient

- Maintain their safety, evolve in the best physical and emotional conditions.
- Avoid physical or temporary gaps in the care received by patients due to changes in the person in charge.
- Patient as centre of care: TOI essential to the success of treatment and the quality perceived by patients and families.
- Transparency in the TOI process: knowing who is responsible for the patient.
- Receive consistent answers that do not differ depending on who performs the TOI.
- Adapt to patient fragility and family situation.
- Identify causes of poor TOI to avoid mortality, morbidity, adverse events, re-admissions.

For the care team

- Work as a team 24 h/365 days a year.
- Coordinate, collaborate between different roles.
- Adapt workloads.
- Convey functional information with a solution-focused structure.
- Support shared reflective practice with critical thinking.
- Empower the recipient of that information to improve the

established plan with the patient.

- Quality independent of the issuing professional's status or skills.
- Increase the satisfaction of the professionals.
- Promote learning, motivating staff in a culture of safety by modulating intimidating behaviours and providing resources and improvement initiatives.

In terms of system sustainability

- Protocols for standardisation of assistance at maximum levels and in soft skills.
- Avoidance of designated medical event (DME) and adverse event (AE), moving from ICU as a risk area for adverse events to the opposite.
- Savings in material (consumable or not), logistic (availability of ICU beds) and human resources derived from this.
- Identification of problems and solutions common to different roles or work teams.

Proactivity in the quality-of-care increases knowledge and responsibility, reducing the negative impact of chance. Adequate TOI should be part of the work of healthcare personnel. This can reduce harm and increase safety in patient care.

Proper TOI in the ICU may be learned. TOI itself is a learning moment. It is not a matter of preparing the clinical round according to what happened during the on-call period, but rather that what happened is meaningful, and giving meaning to the decision-making process during the on-call period.

There are six skills of effective TOI: identifying what information is appropriate, providing anticipatory planning, applying acquired clinical knowledge, being concise, being orderly, and considering the preferences of the TOI recipients (Rattray 2018). TOI is like an iceberg because the little you see (hear) is a small portion of all the groundwork involved. We propose to get out of the comfort of routine and take actions that improve present and future clinical care, individually and collectively. The team of each ICU is the one who must

identify the needs using every day to detect and learn. However, institutional support is decisive for its effectiveness.

The Accreditation Council for graduate medical education (ACGME) requires hospitals accredited for resident training to develop communication skills during TOI. How should our residents learn? The clash between formal teaching and how things are done at each site contributes to the lack of effectiveness of TOI. Is it better to have 'formal' training (courses with standardised content) or informal training by immersion in the 'local culture'? The immersive model, by osmosis of peers, can vary infinitely. We will have to assume "minimums" in terms of form and TOI content. But formal learning fails to make residents feel prepared for adequate TOI. Residents value more experiential learning, based on practice, performing TOI, living the problems of the ward to make with them an adequate TOI and grow in autonomy (Militello et al. 2018). Evidently, formal education does not convey the critical role that real time has in TOI. In addition, interventions by consultants or senior residents can positively influence this process as events unfold. Militello et al. (2018), in his study on how residents prepare for on-call, highlights that TOI is very intuitive, but a broader conceptual framework is required to improve the process and implement measures of TOI quality (Burgess et al. 2020).

At this point, Díaz-Navarro's contribution with the "TALK[®] values" (Díaz-Navarro et al. 2021) stands out: constructive, positive, solution-focused reflections, professional and step-by-step communication. Teams should begin by identifying the good practices that should be maintained and disseminated, and the problems to be addressed by the team itself (example: changes in the assignment of tasks).

Our effort is to make sure that this teaching has a real impact on healthcare. In 2020, the COVID-19 pandemic (Ballasteros et al. 2020) has shown the need to adapt training in comprehensive and cross-cutting communication to the changing requirements of clinical practice. It is necessary to evaluate the impact that TOI

has on healthcare work, on relationships with patients, families, and society. Person-Centred Clinical Communication (PCCC) (Ruiz 2020) is a tool for physicians to achieve their clinical objectives.

Conclusion

Knowing is half the battle. Doing is

the other half. With this summary we intend to improve knowledge, skills, and personal competence by recommending methods that will improve the quality of sharing information, handoff tools, as an essential component in the safe care of our patients in the environment of care of an ICU.


Conflict of interest

Authors have no competing interests. ■

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