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SYSTEMATIC REVIEW

# Patient Identification in the Prevention of Errors and Adverse Events: A Systematic Review

## Identificación del paciente en la prevención de errores y eventos adversos: revisión sistemática

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## ABSTRACT

**Introduction:** when we speak of patient safety, we mean the effort of doctors to evade as much as possible any damage that may be caused to patients when performing a treatment or therapy on them, which is an important part of the care field when working as health personnel. Patient identification plays a significant role in the sanitary sphere. It consists of several steps to guarantee patient safety that will help us amend misinterpretations and prevent medical errors and/or adverse events.
**Objectives:** describe the scientific evidence on correct patient identification as a factor in reducing adverse events and medical errors.
**Methods:** a systematic literature review was carried out in Scopus, Web of Science and Pubmed.
**Conclusions:** the registration and/or double verification systems of patients or samples in hospital environments significantly decrease patient identification errors. Despite these findings, due to the small sample of studies we found, standardization is necessary for developing future meta-analyses or recommendations with a higher level of evidence. The importance of accurate patient identification in medical care is highlighted, and strategies to improve accuracy when identifying patients and thus reduce errors were presented.

**Keywords:** Patient Identification Systems; Safety; Patient Safety; Medical Errors; Systematic Review; Health Decision Making.

## RESUMEN

**Introducción:** cuando se habla de seguridad del paciente es el esfuerzo de los médicos para evadir en lo más posible todo tipo de daño que se le pueda ocasionar al paciente al realizarle un tratamiento o terapia y que es una parte importante en el campo de la asistencia al ejercer la labor como personal de salud. La identificación del paciente juega un papel muy importante en el ámbito sanitario y consta de diferentes pasos todo esto para garantizar la seguridad del paciente que nos va a ayudar a enmendar falencias y prevenir errores médicos y/o eventos adversos.
**Objetivos:** describir la evidencia científica sobre la identificación correcta del paciente como factor en la disminución de eventos adversos y errores médicos.
**Métodos:** se realizó una Revisión Sistemática de la literatura, en Scopus, Web of Science y Pubmed.
**Conclusiones:** los sistemas de rotulación y/o doble verificación de pacientes o muestras en los entornos hospitalarios resultan en una disminución significativa de los errores de identificación de pacientes. No obstante, a estos hallazgos, debido a la muestra pequeña de estudios encontrados, resulta necesaria la estandarización para el desarrollo de futuros metaanálisis o recomendaciones con mayor nivel de evidencia. Se destaca la importancia de la identificación precisa del paciente en el ámbito de la atención médica y se presentaron estrategias para mejorar la precisión de la identificación del paciente y reducir los errores de

identificación de pacientes.

**Palabras Clave:** Sistemas De Identificación De Pacientes; Seguridad; Seguridad Del Paciente; Errores Médicos; Revisión Sistemática; Toma De Decisiones En Salud.

## INTRODUCTION

When we speak of patient safety, we mean the effort of doctors to evade as much as possible any damage that may be caused to patients when performing a treatment or therapy on them, which is an important part of the field of care when working as health personnel. In turn, patient safety is a topic that, as time goes by, is increasingly acquiring more relevance in the care-related sphere. Patient safety comprises a series of lines that help us define it better where safety culture, the human factor and learning take part.[1]

To better define patient safety, we can speak of safety culture that comprises different characteristics in common of different persons that organize a series of points to disseminate them among all the care-related personnel and which follow the same way that is patient safety.[2] Thus be able to build a group order having different environments, either technical or cultural, that influence them.[1,3]

Throughout the history of medicine, patient safety has evolved in different manners where, in each time, there were significant contributions classified mainly as five; we can see that, in the beginning, some civilizations were very strict about the person who practiced healing; therefore, they created different texts that set a beginning in patient safety to guarantee patients efficient care where, in some of these texts, an example would be the Code of Hammurabi with the law of an eye for an eye where they came to be very strict with the doctor who makes a mistake about the diseased.[4]

Medical progress has improved, and they increasingly realized that, with the emergence and use of antiseptics, mortality gradually decreased when healing. On the other hand, hand-washing is a crucial element in any procedure; in the medical sphere, hospitals were gradually implemented. Today, a report has been important to patient safety, where sanitary care is declared to be the main measure; PAHO-WHO is very important nowadays. It resulted from meetings of WHO to guarantee clean, safe care.[4]

Human error impinges on patient safety; there is absolute trust in doctors. This is what the patient places in doctors without realizing that, in addition to being doctors, they are human beings, making them liable to make a mistake like any other person. Where there are also approaches to these errors. The first one is the approach focused on the person. It deals with the errors and the fact that the wish to find the guilty person somehow damages the relationship between the doctor and the patient. The doctor takes a protective stance on this and starts practicing medicine in a different way that may be scarcely beneficial.[5]

Another approach is called the system-based approach, where human error is valid and may occur at any time and where the patient understands that the procedure or treatment may have probable adverse effects. Therefore, the definition provided by WHO about patient safety does not entirely rule out the absence of damage but also a reduction in this damage so that it may occur as an adverse effect of the procedure the patient is going to be submitted to.[5]

In the literature, there are descriptions of diverse manners to identify the patient. They are accepted in some regions of the world. They are controversial in others because they violate patient safety or because there can be many coincidences in the data. In some regions, they abide by a unique identification system. One is the unique patient identifier (UPI) that focuses on a national identification, either document on person. This system is used very much because several parameters decrease. Its weakness lies in the fact that patient privacy may be violated.[6]

The electronic format plays an important role in patient identification; this electronic recognition occurs via a barcode attached to the wristbands of patients to reduce errors when taking blood samples. This method of electronic recognition has the advantage of performing many tasks simultaneously. Still, it can have flaws, so the best way to corroborate and which is being done in the best possible way, is the human work.[7]

The patient identification that is carried out today is the wristbands to promote patient safety; this system makes it possible to prevent different errors in the procedure or treatment to be performed and thus improve patient care by communication. These wristbands include the personal data of the hospitalized patient, and the administration workers implement them.[8]

The procedure or treatment to be performed on the patient must be adequate, and here comes knowing how to identify the person to be treated rightly. This way, we are preventing and reducing any damage to the patient. But for this practice to be carried out correctly, the responsible group of persons must be in proper conditions to guarantee the patient a correct and safe identification, thus preventing, as much as possible, errors that may cost the patient´s life.[8]

Patient identification plays a significant role in the sanitary sphere, consisting of several steps. All this is to

guarantee patient safety that will help us amend misinterpretations; in this first step, all the personal data on the person being verified. The second step consists in achieving informed consent, declaring that the patient agrees with the procedure to be carried out. In the third step, the patient is put in the right place to study them. And the last step is the proper specialist who will perform the respective study.[9]

Incidents can result from choosing the wrong way when performing a procedure or administering medication to the patient. These situations trigger an alteration in the person's health that can be indefinite or leave the person with a particular limitation in carrying out activities. All this process goes hand in hand with patient safety, where this is the damage reduction, not the absence. In turn, it leaves a history providing valuable information that can be innovative for future incidents. Which would collaborate with better care and safer and better decisions.[10]

Medical errors are situations causing an ill resulting from improper medication use or causing damage when the patient is treated with a drug. And this is the main cause of the medical error. Hence the importance of training those in charge of the medication, both the doctor and the nursing staff should know how to correctly use them to apply the medication adequately and thus prevent errors in the care-related sphere.[11]

Several studies have demonstrated the importance of correct patient identification as a way to prevent adverse events and medical errors;[12,13,14] however, developing a piece of research systematizing the evidence on this matter so far will make it possible to elucidate the critical aspects of this topic, its regularities and particularities.

*Objective:* describe the scientific evidence on correct patient identification as a factor in reducing adverse events and medical errors.

## METHODS

*Study Design*

A Systematic Review of the literature was carried out. Said review will abide by PRISMA guidelines (report elements preferred for systematic reviews and meta-analyses)[15]

*Population under study*

Inclusion Criteria

- Randomized clinical trials assessing the efficiency of patient identification to reduce adverse effects and medical errors;
- Prospective or retrospective cohort studies assess patient identification efficiency to reduce adverse effects and medical errors.

Exclusion Criteria

- Review articles, Scientific Letters / Letters to the Editor, Clinical Cases, Editorials, and Original Articles corresponding to Observational Studies.

*Sample Selection and Size*

The analysis units were the abstracts and full text of articles with a design of randomized clinical trials or prospective or retrospective cohort published in Scopus, Web of Science and Pubmed, without any time restriction.

*Strategy for bibliography search*

Pubmed: “Patient Identification Systems”[Mesh] AND “Patient Safety”[Mesh] AND “Medical Errors”[Mesh]

Scopus: “Patient Identification Systems” AND “Patient Safety” AND “Medical Errors”

Web of Science: TS=(“Patient Identification Systems” AND “Patient Safety” AND “Medical Errors”)

*Ethical and legal considerations*

This will be a systematic review of public, open information in which no human subjects participated; therefore, an ethics committee's approval was unnecessary.

## RESULTS

We found 279 references, of which 176 were ruled out as they were not empirical articles, did not address this review's goal or have a full text. Finally, 8 articles were included (figure 1).

Table 1 shows the main results and methodological aspects of the studies included in this review.

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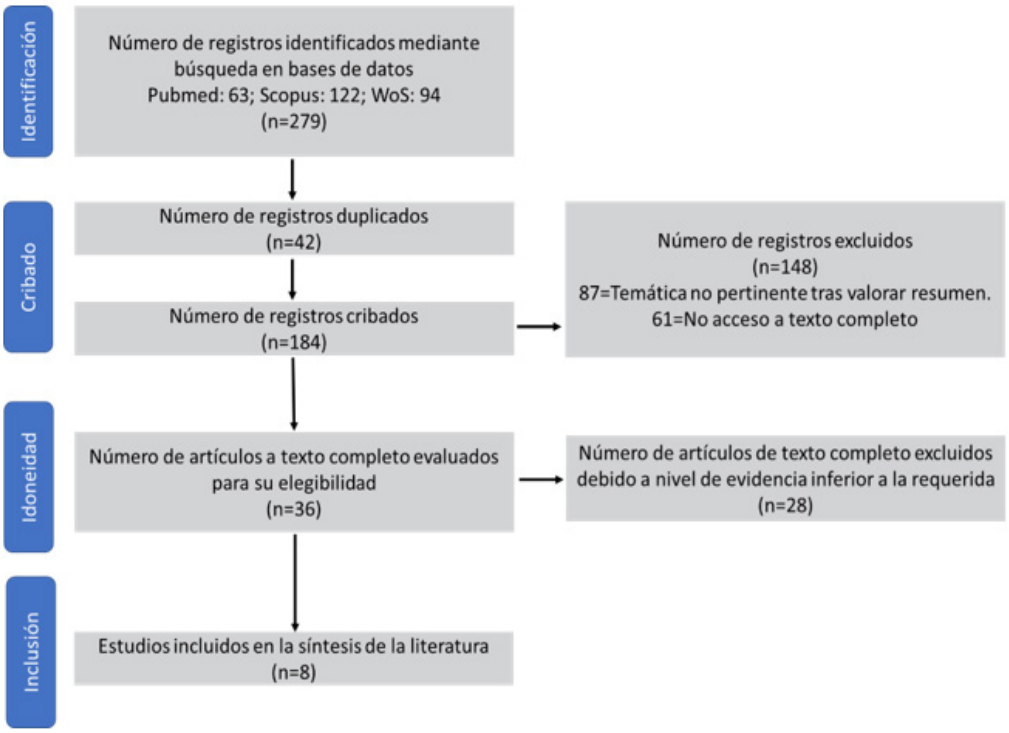


**Figure 1.** Article selection process according to PRISMA flowchart

**Tabla 1.** Características y resultados de los estudios incluidos

| Study | Country | Type of study | Sample | Main results |
|---|---|---|---|---|
| Brown et al.[16], 2011 | United States | Clinical Trial | 227 beds | Mislabeling of laboratory specimens has been found to be a high-risk problem in acute care hospitals. The aim of this study was to reduce the number of mislabeled blood samples. In the first year after implementation of a positive patient identification system using barcodes and computer technology, the number of mislabeling errors decreased from 103 to 8 per year. The result was clinically and statistically significant ($p < 0.001$). |
| Devine et al.[17], 2010 | United States | Systematic review | 11 studies | The estimated rate of wrong-site surgeries varies widely, ranging from 0,09 to 4,5 per 10000 surgeries performed. There is no literature demonstrating the efficacy of the current universal Joint Commission protocol in reducing the rate of wrong-site and wrong-level interventions. |
| Murphy et al.[18], 2007 | United Kingdom | Randomized Clinical Trial | 724 direct observations | Fifteen matched clinical areas from 12 participating hospitals in six countries were included in the trial. Combining data from all participating hospitals, bedside monitoring was performed correctly in 37 % of transfusions during the initial audit period. There was no evidence of a favorable effect of the intervention immediately after its introduction (pooled odds ratio, 1,09; 95% confidence interval, 0,54-2,17). There was also no evidence of a favorable effect after continued use of the intervention for an additional 8 weeks. |
| Ning et al.[19], 2016 | Taiwan | Observational study | 3800 beds | Of the 2000345 specimens collected in 2005, 1023 (0,0511 %) were identified with patient identification errors, compared with 58 errors (0,0015 %) among 3761238 specimens collected in 2014, after serial interventions; this represents a relative reduction of 97 %. The total number (rate) of institutional identification errors contributed from the ED, IPD, and POD over a 10-year period was 423 (0,1058 %), 556 (0,0587 %), and 44 (0,0067 %) errors before interventions, and 3 (0,0007 %), |

| | | | | |
|---|---|---|---|---|
| | | | | 52 (0,0045 %), and 3 (0,0001 %) errors after interventions, representing relative reductions of 99 %, 92 %, and 98 %, respectively. |
| Oliva et al.[20], 2014 | Spain | Observational study | 5948 incidents | During the study period, between 22 and 29 hospitals reported a total of 5948 incidents, of which 5244 were managed by the centers and are the ones analyzed in the study. Sixty-four percent (3380) reached the patient, 18 % (950) created a situation with the potential to cause an incident, and 18 % (914) did not reach the patient. Of the incidents that did reach the patient, 26 % (864) caused harm. The majority of incidents occurred in hospitalization (54 %) and the emergency department (15 %), followed by ICU (9 %) and surgical block (8 %). Those who reported the most incidents were nurses (71 %), followed by physicians (15 %) and pharmacists (9 %). In terms of severity, most were classified as low risk (37 %) or the incident did not reach the patient (36 %). However, there were 40 cases (0,76 %) of extreme risk. In relation to the type of incident reported, most were due to medication error (26,8 %), followed by falls (16,3 %) and patient identification (10,6 %). |
| Palmieri et al.[21], 2008 | Italy | Randomized Clinical Trial | 800 units of analysis | Using our Securebox, the percentage of patients whose diagnosis failed or could not be reached was O,5 % versus 4 % with the traditional method (p = 0,0012). In addition, the percentage of medical and nursing staff who were satisfied with the Securebox compared to the traditional method was 85 % versus 15 %, respectively (p < 0,0001). The mean number of days taken to reach an adequate diagnosis based on the use of the Securebox was 3,38 +/- 1,16 SD compared to 6,76 +/- 0,52 SD with the traditional method (p < 0,0001). |
| Thakkar et al.[22], 2012 | United States | Randomized Clinical Trial | 20 units of analysis | The mean change in contrast level after application of the chlorhexidine-based solution was significantly greater than after application of the iodine-based solution (mean and standard deviation, 59,8 ± 15,7 U vs. 14,9 ± 11,4 U, respectively; p < 0,0001). On average, surgeons were twenty-two times less likely (95% confidence interval, eight to sixty-eight) to consider the markings acceptable for bed identification after preparation with the chlorhexidine-based solution than after preparation with the iodine-based solution. When examining individual letters, surgeons correctly identified 296 of 300 letters in the group prepared with the iodine-based solution and 209 of 300 letters in the group prepared with the chlorhexidine-based solution; the difference was significant (p < 0,0001). |
| Udupi et al.[25], 2020 | India | Clinical Trial | 75 health professionals | Overall, 85,3 % of the subjects experienced anxiety when performing the pre-transfusion identity check according to existing standard practice. After application of the SPON protocol, only 38,7 % experienced mild, moderate or severe anxiety. The overall level of satisfaction also increased from 8,0 % to 38,7 % and none were dissatisfied. Although only 9,3 % were dissatisfied with existing practice, approximately 70,7 % felt the need for a better/additional protocol. No administrative errors were noted. |

## DISCUSSION

Correct patient identification is crucial in any medical environment since it helps prevent errors and improves patient safety. By ensuring that the correct patient should receive the correct treatment, there is a reduction in errors in medication, inappropriate tests and other potential risks to health. Correct patient identification can also help prevent confusion and inadequate communication between the medical staff and the patients, improving care quality and patient satisfaction. In general, correct patient identification is essential to guarantee the safety and quality of health care.[24,25]

As regards the impact of the barcode technology and the bedside printers on reducing the rate of mislabeled laboratory specimens, Brown et al.[16], 2011 found out that the implementation of the barcode technology and the bedside printers significantly reduced the rate of mislabeled specimens from 3,3 % to 0,1 %; most labeling errors occurred at the stage of sample collection, and they were caused by a variety of factors such as the personnel lacking concentration and knowledge; in turn, the barcode technology and the bedside printers helped improve the efficiency and quality of the work done by the nursing staff as well as patient satisfaction.

The results of this study and the findings by Devine et al.[17], 2010 suggest that implementing barcode technology and bedside printers can be an effective strategy to reduce the rate of errors in labeling and improve health care quality.

Similar studies, such as the one carried out by La Scola et al.[26] (2013) describe a verbal confirmation approach for patient identification at the pediatric emergency department that significantly reduced the rate of errors in patient identification.

Hunt et al.[27] (2019) stress the importance of precise patient identification and describe strategies to improve patient identification, including using ID bracelets, barcodes and biometric devices.

Concerning professional training, a German clinical trial similar to the approach and scope of this review examined if, and to what extent, documentation quality as a factor determining correct patient identification can be positively improved by way of interprofessional training; said trial reported that the number of documents with documentation errors was reduced in 37,3 % ($p<0,001$), which points to the creation of recommendations about prevention of errors as an efficient tool to improve patient safety.[28]

Correct labeling of biological samples is essential to prevent diagnosis errors in medical care. When a biological sample, such as a blood sample, body tissue or liquid, is collected and sent to the laboratory to be analyzed, adequate sample labeling is crucial to guarantee that the patient should be correctly identified and the sample assigned to the correct test.

The results of the study performed by Ning et al.[19], 2016 and Palmieri et al.[21], 2008 show that if a biological sample is mislabeled or not correctly labeled, there may be severe consequences for the patient. For instance, if a wrong diagnosis is carried out because of a mislabeled sample, the patient could receive inappropriate or unnecessary treatment, which could either cause damage or delay the adequate treatment.

Labeling errors can generate increased expenses in resources and loss of valuable time for medical care suppliers and patients, which in many cases results in need to collect a new sample or repeat the tests. This second group of analyzed articles shows that correct biological sample labeling is fundamental to guarantee that the results of the tests be accurate and reliable, which helps prevent diagnosis errors and improves health care quality.

## CONCLUSIONS

In this review, it was possible to corroborate that the systems for labeling and/or double verification of patients or samples in hospital environments result in significantly reduced errors in patient identification. Notwithstanding these findings, due to our small selection of studies, standardization is necessary for developing future meta-analyses or recommendations with a higher level of evidence.

The importance of precise patient identification in the medical care sphere is emphasized, and strategies to improve precision in patient identification and reduce errors in patient identification were presented. These studies demonstrate that precise patient identification is crucial for patient safety and medical care quality.

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## CONFLICT OF INTEREST

None.

## AUTHORSHIP CONTRIBUTION

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