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Original article

Appropriateness of urinary catheterization in the hospital setting: A multicenter observational study

Ignasi Garcia-Olivé[a,*], Agustín Urrutia[a], Eva Janeiro[a], Marta Gutiérrez-Valencia[b,c], Leire Leache Alegría[b,c], Jose Ignacio Pijoan Zubizarreta[d], Elisabeth Carreras Robert[e], Rosa García Diez[f], representing the MAPAC-MPC group[◊]

[a] *Hospital Universitari Germans Trias i Pujol, Badalona, Barcelona, Spain*
[b] *Sección de Innovación y Organización, Servicio Navarro de Salud-Osasunbidea, Pamplona, Navarra, Spain*
[c] *Instituto de Investigación Sanitaria de Navarra (IdiSNA), Pamplona, Navarra, Spain*
[d] *Unidad de Epidemiología Clínica-Hospital Universitario Cruces, Barakaldo, Bilbao, Spain*
[e] *Servei d'Epidemiologia, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain*
[f] *Unidad de Calidad, Referente de Seguridad del Paciente, Hospital Universitario de Basurto, Osakidetza, Bilbao, Spain*

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ABSTRACT

Objective: The objective of this study is to analyze the appropriateness of the indication for urinary catheterization (UC) in hospitalized patients and to analyze possible associated factors.
Methods: Cross-sectional observational study conducted in 15 hospitals. Patients over the age of 18 with UC were included in the study. Information on age, sex, healthcare area, documentation of the order in the medical record, and reason for UC was collected. Indications were considered appropriate according to the Centers for Disease Control's (CDC) Urinary Tract Infection Prevention Guidelines. Logistic regression was used to study the relationship of different variables with the appropriateness of UC and the presence of documentation of the reason for UC.
Results: 696 patients with UC at the time of evaluation were included, with a mean age of 73.3 years (SD 14.6), and 45.0% of them were female. The main indications for UC were preoperative, hemodynamic instability, and acute urinary retention. In 17.4% of cases, the reason for UC was not documented, and the prevalence of inappropriateness was 20.3%. Inappropriateness of UC was higher in the Emergency Department (35.1%), followed by medical services (17.2%) and surgical services (8.4%) ($p < 0.001$ in all comparisons). Appropriateness was lower in older patients ($p = 0.021$) and in centers with a higher number of beds ($p < 0.001$).
Conclusions: Unappropriateness of urinary catheterization is a significant problem in our centers, especially in the Emergency Department and in older patients. Specific and multifocal quality improvement programs are needed to enhance knowledge of appropriate indications for UC and potential adverse consequences.

Adecuación del sondaje vesical en el medio hospitalario: estudio observacional multicéntrico

Palabras clave:
Adecuación
Sondaje vesical

RESUMEN

Objetivo: El objetivo de este estudio es analizar la adecuación de la indicación del sondaje vesical (SV) en los pacientes hospitalizados y analizar posibles factores asociados.
Métodos: Estudio observacional transversal realizado en 15 centros hospitalarios. Se incluyeron en el estudio a pacientes mayores de 18 años con SV. Se recogió información sobre edad, sexo, área de atención, documentación de la orden en la historia clínica y motivo del SV. Las indicaciones se consideraron

* Corresponding author.
E-mail address: igarcia.germanstrias@gencat.cat (I. Garcia-Olivé).
◊ Please see a list of the members of the MAPAC-MPC group in Appendix A.

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apropiadas según las Guías de Prevención de Infecciones del Tracto Urinario de los Centers for Disease Control (CDC). Se utilizó la regresión logística para estudiar la relación de diferentes variables con la adecuación del SV y la presencia de documentación del motivo del SV.

Resultados: Se incluyeron 696 pacientes con SV en el momento de la evaluación, con una edad media de 73,3 años (DE; 14,6), el 45,0% eran mujeres. Las principales indicaciones para el SV fueron preoperatorias, inestabilidad hemodinámica y retención urinaria aguda. En el 17,4% de los casos, el motivo del SV no estaba documentado y la prevalencia de inadecuación fue del 20,3%. La inadecuación del SV fue mayor en el servicio de urgencias (35,1%), seguido de los servicios médicos (17,2%) y los servicios quirúrgicos (8,4%) ($p < 0,001$ en todas las comparaciones). La adecuación fue menor en pacientes mayores ($p = 0,021$) y en centros con un mayor número de camas ($p < 0,001$).

Conclusiones: La inadecuación del sondaje vesical es un problema relevante en nuestros centros, especialmente en el servicio de urgencias y en los pacientes mayores. Se necesitan programas de mejora de calidad específicos y multifocales para aumentar el conocimiento sobre las indicaciones apropiadas del SV y sus posibles consecuencias adversas.

Introduction

Urinary catheterization (UC) is an invasive technique, necessary in some situations, but it entails a risk of incidents and/or complications for patients, a workload for nursing staff, and economic costs.

In clinical practice, the placement of a UC is not always justified by the patient's clinical situation. Different estimates suggest that in 9–23% of patients admitted from Emergency Departments, a UC has been performed, of which 30–50% have been done without a documented medical order, and in 30–65% of cases without adequate indication.[1–3]

A urinary catheter should not be placed or maintained in a patient unless there is a specific indication to do so. The main indications for UC considered appropriate are described in the literature.[4]

The MAPAC (Improvement of Adequacy in Healthcare and Clinical Practice) initiative aims to improve the adequacy (favorable benefit/risk ratio) of healthcare and clinical practice by identifying potentially inadequate activities, formulating recommendations, and proposing actions to reduce them.[5]

The objective of our study is to analyze the prevalence of inadequacy in the indication of UC in hospitalized patients in the centers participating in the MAPAC-MPC network. Additionally, the relationship of age, sex, and center size with the adequacy of the UC indication and the presence of UC indication records was explored.

Methodology

This is a cross-sectional observational study, conducted in 15 hospital centers throughout Spain, all of them belonging to the MAPAC-MPC network (Hospital Universitari Vall d'Hebron, Consorci Sanitari de Terrassa, Complex Hospitalari Moisès Broggi, Hospital de la Santa Creu i Sant Pau, Hospital Gregorio Marañón, Hospital de Sant Rafael, Hospital Universitario de Navarra, Hospital García Orcoyen, Hospital Reina Sofía, Hospital Universitario de Cruces, Hospital Universitario de Donostia, Hospital Universitario Basurto, Hospital San Eloy, Hospital de Zumárraga, and Hospital Universitari Germans Trias i Pujol). Professionals belonging to the MAPAC Committees of these centers participated. Hospitalized patients over 18 years old, carrying a UC on the evaluation days, were included, up to a maximum of twenty patients from each area (medical, surgical, and emergency) of each participating center. Patient inclusion was consecutive. Patients with a permanent UC and those who had the UC installed in another center were excluded.

Information on the participants' age and sex, area where the patient was located, existence of a record of the UC indication, area where the UC was performed, and date of UC performance were collected. Data were obtained by consulting the clinical course in the medical records and from the medicine and nursing professionals in charge of the patient.

Indications for UC considered appropriate were obstructive uropathy, acute urinary retention, hemodynamic instability, cardiogenic pulmonary edema, macroscopic hematuria with clots, wounds in the sacral or perineal area, in incontinent patients, perioperative catheterization, prolonged immobilization, with specific indication, neurogenic bladder (with specific indication), and comfort in end-of-life situations, according to the Centers for Disease Control and Prevention (CDC) Urinary Tract Infection Prevention Guidelines. The adequacy criterion was established by reviewing the indication for catheterization, recorded in medical and/or nursing records, by a single evaluator.

A questionnaire through the Clinapsis® application was used for data collection, to be completed online by the person responsible for each center. All information was integrated into the application in an anonymized manner.

The study protocol was submitted to the Research Ethics Committees for evaluation, which considered the study exempt from specific approval as it is an evaluation and improvement study of healthcare quality. A request to waive the documentation of informed consent was approved. The study team did provide the subject with the required consent information, but the study team was not required to obtain the subject's signature on the informed consent document.

Statistical analysis

Quantitative variables were expressed as mean and standard deviation (SD). Frequencies were expressed as total individuals and percentages. Fisher's exact test was used to compare frequencies in different hospitalization areas, and possible associations between sex, age, and number of beds per center with the degree of UC inadequacy and UC indication record were analyzed using logistic regression. Trend analysis of UC inadequacy with patient age and number of beds in the institution was performed using the *rtrend* command, after categorizing these variables by quintiles. All calculations were performed using Stata version 18 (StataCorp. 2023. Stata Statistical Software: Release 18. College Station, TX: StataCorp LLC).

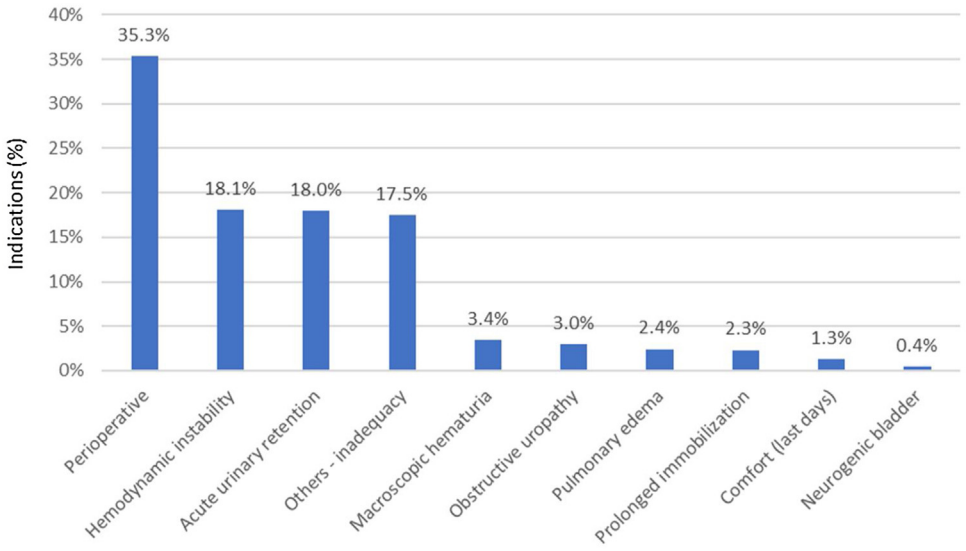

Fig. 1. Indications for urinary catheterization considered appropriate.

Table 1
Description of the study population.

Age, years (mean, SD)	73.3 (14.6)
Female, n (%)	313 (45.0)
Catheterization area, n (%)	
Medical service	149 (21.4)
Surgical service	284 (40.8)
Emergency department	258 (37.1)
Other	5 (0.7)
Indications for urinary catheterization[a]	
Perioperative	246 (35.3)
Hemodynamic instability	126 (18.1)
Acute urinary retention	125 (18.0)
Pulmonary edema	17 (2.4)
Macroscopic hematuria	24 (3.4)
Prolonged immobilization	16 (2.3)
Obstructive uropathy	21 (3.0)
Comfort (last days)	9 (1.3)
Neurogenic bladder	3 (0.4)
Others – inappropriate	141 (20.3)
Reason recorded, n (%)	
Yes	456 (65.5)
No	121 (17.4)
Surgical protocol	119 (17.1)

SD: standard deviation; *n*: number of patients.
[a] The patients could have more than one indication for the urinary catheterization.

Table 2
Indications for the 141 urinary catheterizations which were considered to be inappropriate.

Reasons for urinary catheterization	*n* (%)
Diuresis control	71 (50.3)
Renal insufficiency	7 (5.0)
Decreased level of consciousness	6 (4.2)
Urine sample collection	6 (4.2)
Agitation	2 (1.4)
Gastrointestinal bleeding	2 (1.4)
Stroke	2 (1.4)
Others	45 (31.9)

Results

A total of 696 patients from the 15 participating centers were included. Patient characteristics are described in Table 1. Most analyzed patients (41%) were under the care of a surgical service. The overall percentage of UC inadequacy was 20.3%, and in an additional 17.4% of patients, the reason for UC was not recorded. The main indications for UC were perioperative catheterization (35.5%), hemodynamic instability (18.1%), and acute urinary retention (18.0%) (Fig. 1). Among the indications considered inappropriate, the most common was urine output monitoring (50.3%), followed by decreased level of consciousness and urine sample collection (Table 2).

When comparing the percentage of UC inadequacy according to the hospitalization area, differences were found between them ($p < 0.001$) (Fig. 2). Thus, the percentage of inadequacy was higher in the Emergency Department than in medical services (35.1% vs. 17.2%; $p < 0.001$), or surgical services (35.1% vs. 8.4%, $p < 0.001$). UC inadequacy was also higher in medical services compared to surgical services (17.2% vs. 8.4%, $p < 0.001$).

Regarding the registration of the UC indication in the medical record, no differences were found between the different hospitalization areas ($p = 0.051$).

Patient sex was not associated with a higher percentage of inappropriate UC, but it was associated with the absence of UC registration ($p = 0.347$ and $p = 0.036$, respectively). After categorizing age and number of beds per center by quintiles, a trend toward higher inadequacy was observed as patients' age increased ($p = 0.021$) (Fig. 2) and in centers with a higher number of beds ($p < 0.001$) (Fig. 3). There were no differences between these two variables and the registration of the UC indication ($p = 0.08$ for age and $p = 0.11$ for the number of beds).

There was substantial variability in the degree of UC inadequacy among the different participating centers in the study, ranging between 0 and 24.8%.

Discussion

For years, UC inadequacy has been a concern among healthcare professionals, reflected in numerous guidelines and recommendations on appropriate indications for catheterization.[4,6,7]

The placement of a urinary catheter is associated not only with a workload for nursing staff and economic costs but also with a risk of incidents and/or complications for the patient. It particularly contributes significantly to urinary tract infections, as 43% of them in hospitalized patients occurred in patients who had been catheterized before the onset of urinary tract infection.[8]

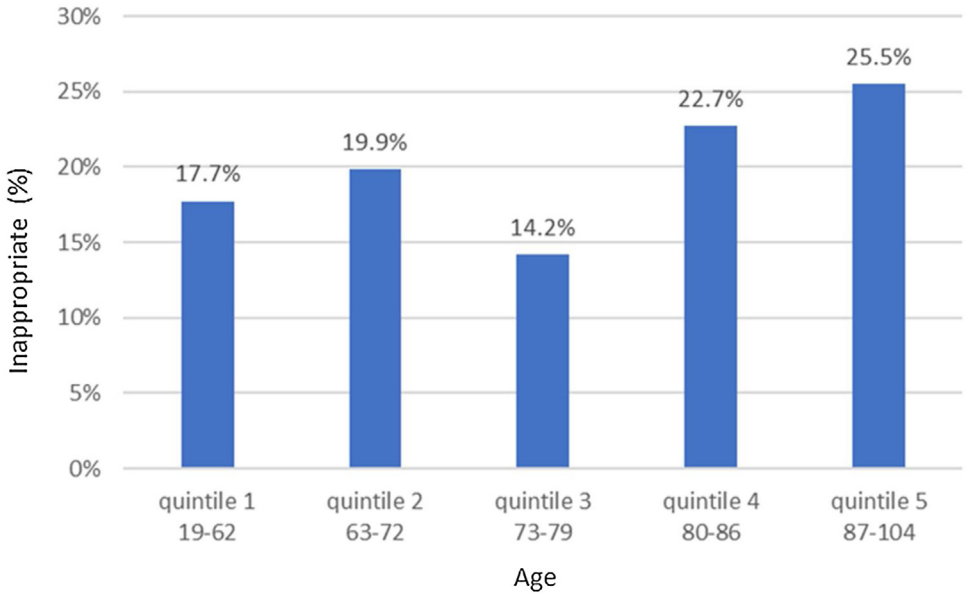

Fig. 2. Percentage of inappropriateness of urinary catheterization in relation to age categorized by quintiles.

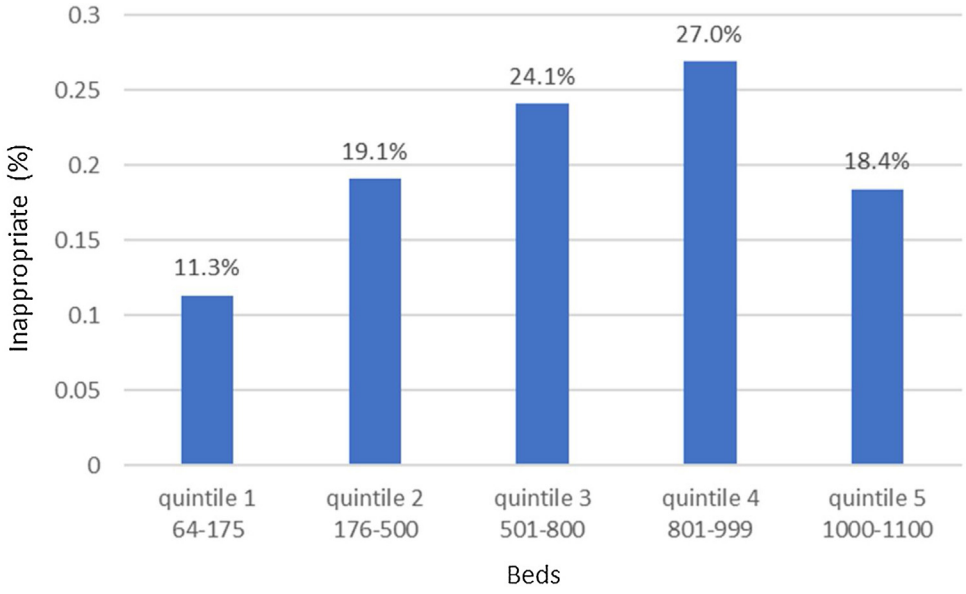

Fig. 3. Percentage of inappropriateness of urinary catheterization in relation to the number of beds in the hospital center categorized by quintiles.

Catheter-associated urinary tract infection is the most prevalent hospital-acquired infection and is associated with significant morbidity, mortality, and costs.[9] Hospitalizations due to complications associated with urinary catheterization have quadrupled from 2001 to 2010.[10]

The overall rate of UC inadequacy in our study is 20.3%, which falls within the rates reported by other studies, for example, 15% among all patients admitted to a general hospital[11] or 38% of hospital admissions.[12]

In our case, 17.4% lacked a documented record of the indication or a UC protocol, a figure that compares favorably with some data from the literature. For example, there were no documented records in hospitalized patients from 26%[11] or a 33%[3,13] to 52.7%. In the case of centers participating in the study, the registration percentage ranged from 23.3% to 100%.

In a previous study conducted in 2014 in the Internal Medicine service of one of the participating hospitals (HUGTiP) with a predominantly elderly population, a catheterization prevalence of 19% and a UC inadequacy rate of 29.4% were found.[15] In another study from 2012 carried out in medical areas of a large hospital in Madrid, a prevalence of catheterized patients of 12.1% was obtained, with UC indication being inappropriate in 26.5% of them,[14] inadequacy rates higher than those found in medical areas (17.2%) in our study.

In the centers included, a higher proportion of inadequacy was found in Emergency Departments, followed by medical services, and finally surgical services. Laan et al. also found significantly higher rates of UC inadequacy in medical areas than in surgical areas (UC inadequacy in surgical services is 10.4% and 32.4% in medical services), concluding, furthermore, that admission to medical areas is the main risk factor for UC inadequacy.[16]

Since half of non-obstetric hospital admissions are made through the emergency department, this area deserves special attention regarding UC adequacy. In a study conducted in patients

admitted to the medical area, 91% of urinary catheters were placed within the first 24 h of admission to the emergency department. Therefore, when analyzing adequacy by services, it is important to assess where catheterization was initiated. In our case, 21% of catheterizations were performed in the emergency department. 35.1% of urinary catheters placed in the Emergency Department were inappropriate, while in the literature, the percentage of inadequacy ranges from 15%[11] to 47%.[2,13] The high prevalence of catheterized patients in emergency departments, along with the higher proportion of inadequacy in this area, suggests that prioritizing initiatives and measures aimed at improving adequacy in this hospital area could be a timely strategy. The high rate of inappropriate UC in emergency services calls for an analysis of the internal processes within these units. Frequently, the decision to insert a catheter is made at the initiative of the nursing team during the initial patient assessment. The common occurrence of service saturation, the presence of trainee doctors, verbal orders, and the inherent need to prioritize and expedite care are factors that may explain this situation. In this context, it is important to emphasize the requirement for a written medical prescription for UC placement. Strategies to decrease inappropriate UC in emergency services, such as "in and out" catheterization for urine specimen collection, or the use of urinals in patients with mobility constraints, have been suggested. Organizational context can influence the effectiveness of such measures and must be taken into account in their design.[18] Performance feedback is an important element of improving professional practice,[19] and it has shown to be effective in the decrease of inappropriate UC.[17]

As in our study, in most of the literature,[14–16] no association has been found between female sex and UC inadequacy. However, like in our study, the literature is quite consistent with the association between age and UC inadequacy.[14–16] Several studies have described that advanced age is a significant risk factor for catheter-associated urinary tract infection,[20] with a high frequency of multi-pathogen infection, a proportion of fungi infection which is not low,[21] a low nutritional status,[21] and a case fatality rate of 6.2%.[22] Interventions aiming to reduce the use of urinary catheters in geriatric patients are desirable, and several successful initiatives have been reported.[23]

We did not find an association between the absence of registration of the reason for catheterization with sex, age, or the number of hospital beds. The study design (cross-sectional) did not allow us to analyze the duration of catheterization, which is an important component of inadequacy since, in addition to correct indication, the catheter must be removed as soon as it is no longer necessary.[4]

It is clear that UC inadequacy is a problem that continues to exist in our centers. To reduce its incidence, specific and multifocal healthcare quality improvement programs are needed to improve knowledge of UC, its correct indications, the importance of early removal, and the adverse consequences (infections, iatrogenic injuries, etc.) that its use may entail,[24–26] especially focused on emergency and medical areas.

Limitations of our study include the fact that patient selection was consecutive rather than randomized. As a result, the statistical measures we provide may be biased, and the overall uncertainty is likely greater than that quantified by randomized statistical measures.

In conclusion, the data obtained in this multicenter study show a considerable proportion of inadequacy in the indication of urinary catheterization, with urine output monitoring being the main reason. The proportion of inadequacy varies among centers, and it is higher in patients in Emergency Departments, followed by medical services and finally surgical services. A substantial number of patients were found to have no record of the reason for UC placement, which is an important factor for promoting safety and appropriateness of the procedure. It was found that inadequacy is higher in older patients and in larger centers. Measures aimed at improving the adequacy of this practice need to be encouraged, emphasizing training on appropriate indications and the risks associated with UC. Due to its greater impact, initiatives to improve adequacy in emergency services could be prioritized, focusing on older patients.

Ethical considerations

After review by Ethics Committee, informed consent was not considered relevant and it was not obtained.

Funding

No funding was obtained for this study.

Conflict of interest

The authors declare that they have no conflict of interest.

Appendix A. The MAPAC-MPC group are:

CST Terrassa: Salud Reyes Medina, Olga Puche Gállego, Yolanda Fernández Parra, Meritxell Zaguirre Medina, Maria José Esteve.

Hospital Garcia Orcoyen: Beatriz Gómez Usua.

Hospital Germans Trias i Pujol: Irene Torrecilla, Aram Boada

Hospital Gregorio Marañon: M. Concepción Gonzalez Lluva, Irene Bretón, Ana Maria Pastor Cordero, Rubén Flores.

Hospital Reina Sofía: Montse Torres Berdonces.

Hospital San Eloy: Jon-Ander Puerto-Sánchez, Sara Ruiz-Osle.

Hospital San Rafael: Mercè Clarós Ferret.

Hospital de la Vall d'Hebron: Júlia Salvador, Karla Salas, Dimelza Osorio, Lola Álamo.

Hospital Universitario de Navarra: Oihane Vieira Galán, Mª Angeles Romero Lasheras, Ana Mateo Cervera, Elene sancho Sena.

Hospital Moisès Broggi: Dolors Pintado Ferreño.

Hospital de la Santa Creu i Sant Pau: Ignasi Bolíbar, Xavier Bonfill, Ascensión García, Teresa Puig, M Jesús Quintana, Carolina Requeijo, Laura Samsó, Ivan Sola, Gerard Urrútia, Olga Savall Esteve, Pilar Gabriela Bruning.

Hospital Universitario Donostia: Rocio López Santiago, Maria José Pizarro Porteros, Rosa Maria Otamendi Juanena, Itziar Agote Vela, Maite Cipitria Notario, Iratxe Urreta Barrallobre.

Hospital de Zumárraga: Kizkitza Lasa Garmendia, Eva Maria Alarcón Duque, Miren Arrieta.

Servicios Centrales Servicio Navarro de Salud-Osasunbidea: Arantxa Elizondo Sotro, Luis Carlos Saiz, Juan Erviti.

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