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Avoidable Adverse Events Related to Ignoring the Do-Not-Do Recommendations: A Retrospective Cohort Study Conducted in the Spanish Primary Care Setting

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Objective: This study aimed to measure the frequency and severity of avoidable adverse events (AAEs) related to ignoring do-not-do recommendations (DNDs) in primary care.

Methods: A retrospective cohort study analyzing the frequency and severity of AAEs related to ignoring DNDs (7 from family medicine and 3 from pediatrics) was conducted in Spain. Data were randomly extracted from computerized electronic medical records by a total of 20 general practitioners and 5 pediatricians acting as reviewers; data between February 2018 and September 2019 were analyzed.

Results: A total of 2557 records of adult and pediatric patients were reviewed. There were 1859 (72.7%) of 2557 (95% confidence interval [CI], 71.0%–74.4%) DNDs actions in 1307 patients (1507 were performed by general practitioners and 352 by pediatricians). Do-not-do recommendations were ignored more often in female patients ($P < 0.0001$). Sixty-nine AAEs were linked to ignoring DNDs (69/1307 [5.3%]; 95% CI, 4.1%–6.5%). Of those, 54 (5.1%) of 1062 were in adult patients (95% CI, 3.8%–6.4%) and 15 (6.1%) of 245 in pediatric patients (95% CI, 3.1%–

9.1%). In adult patients, the majority of AAEs (51/901 [5.7%]; 95% CI, 4.2%–7.2%) occurred in patients 65 years or older. Most AAEs were characterized by temporary minor harm both in adult patients (28/54 [51.9%]; 95% CI, 38.5%–65.2%) and pediatric patients (15/15 [100%]).

Conclusions: These findings provide a new perspective about the consequences of low-value practices for the patients and the health care systems. Ignoring DNDs could place patients at risk, and their safety might be unnecessarily compromised.

Trial Registration Number: NCT03482232.

Key Words: patient safety, medical error, medical overuse, primary care

Abbreviations: AE = adverse event, AAE = avoidable adverse event, ATC = Anatomical Therapeutic Chemical Classification System, DND = do-not-do recommendations, GP = general practitioner, ICD = International Classification of Diseases, ICPC = International Classification of Primary Care, PED = pediatrician, PSA = prostate-specific antigen

(*J Patient Saf* 2021;00: 00–00)

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The authors disclose no conflict of interest.

Supplemental digital contents are available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.journalpatientsafety.com).

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Medical overuse is a universal phenomenon present in rich and developing countries and across all health professions and specializations.^{1–4} Overuse is defined as care that can lead to harm and consumes resources without adding value to patients.^{5–7} The magnitude of overuse varies worldwide, depending on the service and the definition of appropriate care for patients. Medical overuse ranges from 1% to 80% depending on the service and country.¹ Despite a majority of studies having focused on hospital services, a high prevalence of overuse is also expected in primary care. Unnecessary care can lead to patient harm and medical waste.⁸

Several initiatives have been launched to draw attention to this problem, to overcoming the challenge of how to measure overuse, and to reduce its frequency. The do-not-do recommendations (DNDs; National Institute for Health and Care Excellence) has contributed to focusing on low-value practices that should be eradicated. "Choosing Wisely" (Advancing Medical Professionalism to Improve Health Care, American Board of Internal Medicine) has pursued the same goal. Although initially carried out in the United States and Canada, it has likely been the most wide campaign throughout the world.^{9–12} In Spain, the "Commitment to the Quality of Scientific Societies" initiative pursued the same purpose by applying a similar methodology: to establish, based on scientific evidence and consensus among professionals, what should not be done in hospitals and primary care.¹³

A majority of studies have focused on reductions in utilization rates rather than on a change in the appropriateness of services (such as outcome, cost, or patient experience).^{14–17} Only a few studies have included a measure of unintended consequences such as adverse events (AEs).^{18,19}

Adverse event has been defined as the unintentional harm suffered by patients throughout health care that is related to the care received and not the patient's underlying illness.²⁰ Avoidable AEs

(AAEs) occur as a result of an identifiable and modifiable cause or when the harm could be prevented by changing the care process and following the practice guidelines.²¹ Although the relationship between overuse and patient safety is expected, there are scarce studies about the consequences of medical overuse on patient safety. Moreover, the possibility of causing harm to patients by ignoring the DNDs should be studied in primary care.²² This is particularly relevant in countries with national health systems, where primary care is the gateway to the health system.

Primary care in Spain includes the practices of general practitioners (GPs) and pediatricians. Spain has a total of 17 autonomous communities, each having the capacity to manage and organize the health resources (hospitals and primary care) located in its territory. In the Spanish health care model, primary care physicians (GPs and pediatricians) play the role of gatekeepers to the health system. Each patient has their electronic medical record with all their health information entered. Primary care physicians can review information on patient hospitalizations and vice versa

for hospital-based physicians. Not all health services use the same diagnostic classification. Currently, the *International Classification of Diseases, Ninth Edition (ICD-9)*, *ICD-10*, and *International Classification of Primary Care, Second Edition (ICPC-2)* are being used to code diagnoses, according to the different health services in each autonomous community.

The aim of this study was to measure the frequency and severity of AAEs associated with doing what should not be done (overuse related to ignoring DNDs) in primary care in Spain.

METHODS

A retrospective cohort study analyzing the frequency and severity of AAEs related to DNDs (7 from family medicine and 3 from pediatrics) was conducted.

The DNDs considered were a selection of practices included in the lists of consensus-based recommendations made by scientific societies of the “Commitment to the Quality of Scientific Societies.”

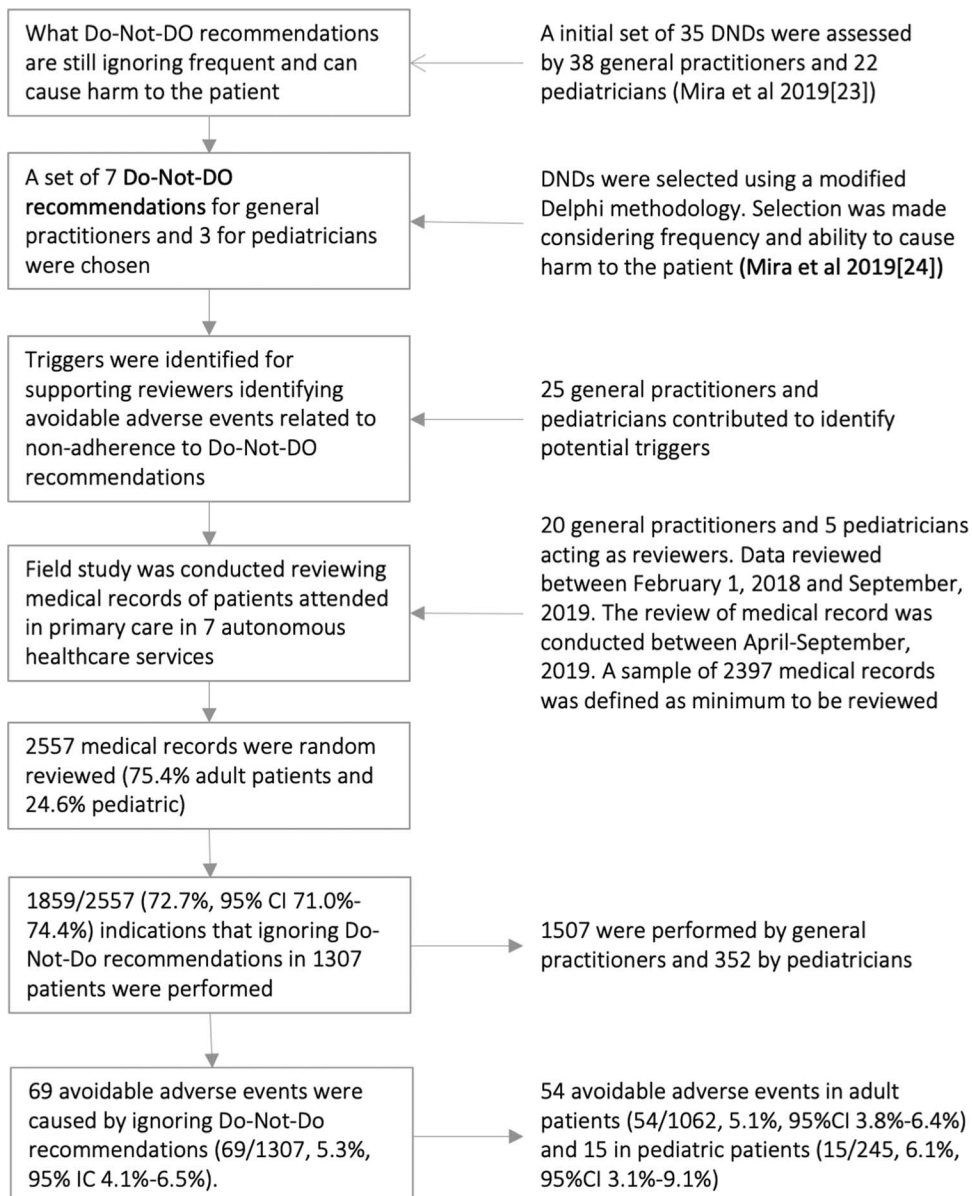


FIGURE 1. Flowchart of study phases and main outcomes.

The DNDs included in this study were those that meet the following criterion: first, there was a broad consensus that they represented very low value for the patients, and in some cases, they could be harmful. Second, they were present relatively frequently in practice and could be reliably identified. Third, they could be the cause of an AAE. These DNDs were defined in a previous study involving 60 GPs and pediatricians. A set of 35 DNDs was assessed, considering their estimated frequency in primary care and the likelihood of causing an AAE. In addition, the capacity to be detected when seeking information in the medical records was assessed. Ten DNDs fulfilling criteria were chosen (Box 1).²³

Box 1 Do-not-do recommendations included in this study.

Do-not-do recommendations during the treatment for adults' patients

Do not use benzodiazepines (*ATC*: N05B-BA, BB, BE; N05CD; N05CF; N03AE) for the treatment of insomnia (*ICPC-2*: P06) in people older than 65 years.

Do not prescribe nonsteroidal anti-inflammatory drugs (*CTAs*: M01A, M01AC, M01AE, M01AG, M01B) to patients with high blood pressure, heart failure, chronic kidney disease, or liver cirrhosis (*ICPC-2*: K86, K87, K77, U99, D97).

Do not starter kit paracetamol (*ATC*: N02BE01) in doses of 1 g.

Do not indicate antibiotic treatment in acute bronchitis when the patient does not have COPD (*CIAP*—2 R95), heart failure, diabetes, pneumonia, tonsillitis, *Bordetella* infection, or kidney disease or is undergoing active chemotherapy (*ICPC-2*: K77, T89, T90, R72, R76, U99).

Do not prescribe lipid-lowering agents (*ATC*: C10AA, C10AB) in patients older than 75 years without previous cardiovascular events.

Do not screen asymptomatic patients older than 50 years for prostate cancer using prostate-specific antigen.

Do not perform imaging tests in nonspecific low back pain (*ICPC-2*: L03) without warning signs before 6 weeks.

Do-not-do recommendations during the treatment for pediatrician patients

Do not prescribe antibiotics (*ATC*: J01CA, J01D, J01AA) for pharyngitis or tonsillitis, even if the patient does not test positive for streptococcus (*ICPC-2*: R72).

Do not prescribe mucolytics (*ATC* antitussives: R05CB, R05D) or antibiotics (*ATC*: J01CA, J01D, J01AA) for respiratory tract infections (*ICPC-2*: R72, R74, R76).

Do not combine or alternate treatment with ibuprofen and acetaminophen (*ATC*: M01AE).

ATC, Anatomical Therapeutic Chemical Classification System; *ICPC-2*, International Classification of Primary Care.

computerized databases of primary care medical records of patients who had used health services between February 2018 and September 2019 in Andalusia, Aragon, Castile La Mancha, Catalonia, Valencian Community, Madrid, and Navarre. This period was defined after conducting a preliminary trial for extracting data to ensure the feasibility of the procedure and to obtain reliable data. Medical charts were retrieved through a simple randomized procedure, by reviewing 1 of every 3 medical records of the total number of patients assigned to a doctor. The research includes the steps outlined in Figure 1.

The review of these computerized medical records was conducted by a total of 20 GPs and 5 pediatricians acting as reviewers. Reviewers decided whether to review between 77 and 125 stories each according to their work duties. They were independent of the physicians who indicated treatment to the patients during the period in which medical records were reviewed. The review of medical records was conducted between April and September 2019.

Depending on the convention in the health services of each autonomous community, *Anatomical Therapeutic Chemical Classification System (ATC)*, *ICD-9*, *ICD-10*, and *ICPC-2* codes were used to correctly identify the patient records that were included in the study (Supplementary File 1 <http://links.lww.com/JPS/A392>). A 3-step method for registered potential AAEs was applied. First, ignored DNDs were evaluated, then triggers suggesting potential AAEs in the record were sought. Once the reviewer identified a trigger, they underwent an in-depth review of the record using a template. The reviewers subsequently determined whether an AAE linked to DNDs had occurred.

The reviews' template and triggers were implemented using a computer application for managing the data to reduce variability between reviewers in the way data were recorded and to avoid coding errors. Confidentiality was ensured using a blind registration system that was developed for the study.

We used as triggers diagnosis, treatments, or services in a record that could indicate that a safety event had occurred. The presence of a trigger did not indicate the presence of AAEs. For each identified trigger, the reviewer assessed whether or not it reflected the presence of a safety event (AAE).

These triggers were designed specifically for this study, involving 25 primary care professionals in a previous study.²³ These physicians were asked what AAEs could be caused when the DNDs included in this study were ignored. They also suggested potential drivers for each AAE (e.g., referral for psychotherapy for benzodiazepine abuse, early onset of withdrawal or hospital admission for a fall, admission to the intensive care unit). These triggers were used as help during the review of the chart, prevailing the criteria of the reviewer who had full access to the patient information to make their assessment. Once an AAE was identified, reviewers rated its severity and identified its relationship with ignoring DNDs using the following scales.

The harm severity of each incident was assessed on a 0–7 scale (0, no harm; 1, emotional harm; 2, insignificant harm; 3, minor temporary harm; 4, major temporary harm; 5, minor permanent harm; 6, major permanent harm; and 7, death). This assessment was adapted from the scale used previously by Woods et al²⁴; incidents rated as 3 or higher were recorded as AAEs.

Reviewers assessed if the AAE was related to ignoring DNDs using a 0–7 scale (0, no relationship between ignoring DNDs and AAE; 1, ignoring DND is unlikely to have contributed to the AAE; 2, ignoring DND could have contributed to the AAE to some extent; 3, ignoring DND could be the cause of some of the harm associated with the AAE; 4, ignoring DND is probably one of the causes of the AAE; 5, ignoring DND probably caused the AAE; 6, complete certainty that ignoring DND is one of the direct causes of the AAE; and 7, complete certainty that ignoring DND is the only direct cause of the AAE). Ratings higher than or

Procedure

This was a coordinated, multicenter, national research project. Data (AAEs related to DNDs) were randomly extracted from

equal to 4 were deemed to indicate a positive relationship between the AAE and ignoring DND.

The sample was stratified, considering the annual number of appointments with GPs and pediatricians, by age groups as follows: 30 to 45 years (11.0%), 46 to 64 years (13.0%), 65 to 74 years (52.6%), 75 to 80 years (14.3%), and >80 years (9.1%) in adults and 3 to 12 months (35.2%), 2 to 5 years (35.2%), and 6 to 12 (29.6%) in minors. In all age groups, the numbers of males' and females' charts were equal. For a 95% confidence level and an accuracy (expected error) of 2%, a review of a minimum of 2397 medical records was considered necessary.

Interrater Agreement

Before starting the field study, 15 medical records randomly chosen were assessed by pairs of reviewers to determine the degree of agreement identifying AAEs and whether ignoring DNDs was linked to them using the predefined scale. The interrater agreement between reviewers was calculated using Cohen κ coefficient.²⁵ This analysis determined the adequacy of the procedure to establish the degree of relationship between AEs and ignoring DNDs.

During the study, the reviewers referred to a consultant who, in doubtful cases, advised the reviewer how to code the information. These consultants were physicians who participated in the APEAS study, designed to assess the frequency of AEs in primary care in Spain.²⁶

Study Variables

In this study, continuing to do what should not be done (DNDs) was used as a measure of overuse. The frequency and severity of AAEs related to ignoring them were also measured. This study only registered AAEs that originated in primary care.

Data Analysis

The frequency of AAEs was calculated as the number of patients with at least one event that resulted in unintentional harm. The crude DND and AAE rates were calculated; considering the

differences in frequencies between male and female, the adjusted rate by age group and sex was determined by referring to the 2018 frequency data provided by the interactive application of the Primary Care Information System of the Ministry of Health, Consumption and Social Welfare. χ^2 Tests with Yates correction were conducted to compare the frequency of ignoring DNDs and AAEs between male and female, and the Cochran-Mantel-Haenszel test was used to analyze the differences in the adjusted rate between both sexes. The DND screening by prostate-specific antigen (PSA) was not considered in this analysis. Statistical significance was set at $P < 0.05$ (2-tailed) for all the tests used, and the analyses were conducted using the Statistical Package for the Social Sciences (SPSS) V. 24.0 (SPSS, Chicago, Illinois).

Ethics

The study protocol was approved by the Ethics Committee of Primary Care Clinical Research of the Valencian Community (reference: DGFPS/SDGPOI/PLG/JMV/BP/PS/RI; September 28, 2017), Navarre Government Ethics Committee of Drugs Research (reference number: 432; July 26, 2019), and Research Centre of the Welfare Management of Primary Care in Madrid (reference number: 26/18; January 9, 2019).

RESULTS

A total of 2557 medical records were randomly reviewed (adult population: 1928/2557; 75.4%).

Frequency of Ignoring DNDs

In the period analyzed, there were 1859 (72.7%) of 2557 (95% confidence interval [CI], 71.0%–74.4%) cases of ignoring DND in 1307 patients. Of those, 1507 were performed by GPs and 352 by pediatricians. More than one case of ignoring DND was identified in 443 patients (Table 1). Furthermore, ignoring DNDs was identified in 901 (62.1%) of 1452 (95% CI, 59.6%–64.5%) patient records in adult patients 65 years or older.

TABLE 1. Do Not Dos and AAEs Frequencies During the Last 2 Years

	GP (n = 1928)	%	PED (n = 629)	%
No. medical records in which at least one DND was identified				
Females	583/1004*	58.1	122/317	38.5
Males	479/924	51.8	123/312	39.4
Total	1062/1928	55.1	245/629	39.0
No. medical records with more than one DND				
Females	211/1004*	21.0	42/317	13.2
Males	145/924	15.7	45/312	14.4
Total	356/1928	18.5	87/629	13.8
No. patients suffering from at least one AAE related to ignoring DNDs				
Females	32/583	5.5	7/122	5.7
Males	22/479	4.6	7/123	5.7
Total	54/1062	5.1	14/245	5.7
No. patients who suffered more than one ignoring DND-related AAEs				
Females	0	0	0	0
Males	0	0	1/123	0.8
Total	0	0	1/245	0.4

n = 2557. These data include AAEs related to ignoring DND recommendations about screening of prostate cancer in asymptomatic PSA patients older than 50 years.

* $P < 0.05$.

Frequency of Ignoring DNDs and Sex Differences

Do-not-do recommendations were ignored more often by female adult patients (crude rate, 583/1004 [58.1%; 95% CI, 55.0–61.1]; adjusted rate, 49.4% [95% CI, 48.5–50.3]) than by male adult patients (crude rate, 430/924 [46.5%; 95% CI, 43.3–49.8]; adjusted rate, 41.8% [95% CI, 40.8–42.9]; crude rate, $\chi^2 = 25.2$ [$P < 0.0001$]; adjusted rate, $\chi^2 = 112.6$ [$P < 0.0001$]). In pediatric patients, no differences were found between males and females in the frequency of ignoring DNDs (Table 1).

Frequency of AAEs Related to Ignoring DNDs

Sixty-nine AAEs were recorded related to ignoring DNDs (69/1307 [5.3%]; 95% CI, 4.1%–6.5%). Of those, 54 (5.1%) of 1062 were in adult patients (95% CI, 3.8%–6.4%) and 15 (6.1%) of 245 in pediatric patients (95% CI, 3.1%–9.1%). Reviewers considered that 18 (33.3%) of 54 AAE were caused mainly by ignoring DNDs (Table 2). In adult patients, the majority of AAEs (51/901; crude rate, 5.7% [95% CI, 4.2%–7.2%]) occurred in patients 65 years or older and 3 in patients younger than 65 years (3/161; crude rate, 1.9% [95% CI, 0%–4.0%]; $\chi^2 = 4.1$, $P = 0.04$).

The degree of interevaluator agreement ranged from substantial (0.64–0.76) to a perfect (0.80–1) agreement. During the study, the reviewers shared and agreed on 17 cases with the consultants.

Frequency of AAEs Related to Ignoring DNDs and Sex Differences

Female patients suffered from a greater number of AAEs because of ignoring DNDs than did male patients (crude rate female, 32/583 [5.5%; 95% CI, 3.6–7.3]; crude rate male, 22/430 [5.1%; 95% CI, 3.0–7.2]; $\chi^2 = 0.01$, $P = 0.9$; adjusted rate female, 4.9% [95% CI, 4.4–5.5]; adjusted rate male, 4.0% [95% CI, 3.4–4.7]; $\chi^2 = 3.9$, $P = 0.047$).

Severity of AAEs

Most AAEs were characterized by temporary minor harm, in both, adult patients (n = 28/54 [51.9%]; 95% CI, 38.5%–65.2%) and pediatric patients (n = 15/15 [100%]). No deaths were observed in relation to ignoring DNDs (Table 3). The severity of AAEs suffered by male and female patients was similar both in the adult and pediatric populations.

In adult patients, AAEs with the greatest severity were produced when ignoring the following DNDs: avoiding starting paracetamol treatment in doses of 1 g (4 AAEs with temporary severe harm) and prescribing lipid-lowering agents in patients older than 75 years without previous cardiovascular events (1 AAE with temporary severe harm). There were 11 mild AAEs with permanent harm to the patients associated with using benzodiazepines for the treatment of insomnia in people older than 65 years; 14 mild AAEs with temporary harm associated with prescribing nonsteroidal anti-inflammatory drugs to patients with high blood pressure, heart failure, chronic kidney disease, or liver cirrhosis; and 6 other AAEs associated with using an antibiotic treatment in acute

TABLE 3. Severity of AAEs Related to Ignoring DNDs

	GP (n = 54)	%	PED (n = 15)	%
Minor temporary harm				
Females	16/32	57.1	7/7	100
Males	12/22	54.5	8/8	100
Total	28	51.9	15	100
Major temporary harm				
Females	6/32	54.5	0	0
Males	5/22	22.7		
Total	11	20.4	0	0
Minor permanent harm				
Females	9/32	64.3	0	0
Males	5/22	22.7		
Total	14	25.9	0	0
Major permanent harm				
Females	1/32	100	0	0
Males	0	0		
Total	1	1.9	0	0

bronchitis when the patient did not suffer from chronic obstructive pulmonary disease (COPD), heart failure, diabetes, pneumonia, tonsillitis, *Bordetella* infection, or kidney disease.

In pediatric patients, 13 AAEs were identified with mild temporary harm to the minor associated with prescribing antibiotics for pharyngitis or tonsillitis when the patient did not test positive for streptococcus and 2 AAEs associated with ignoring DNDs to not prescribe mucolytics or antibiotics for respiratory tract infections.

The number of AAEs was higher in females than in males in 4 of the 7 DNDs studied (Table 4). Statistically significant differences were not observed in any of the cases between the 2 subsamples. Furthermore, in the pediatric subsample, there were no differences in the number of AAEs between males and females (Table 5).

DISCUSSION

Much of the studies have focused on the frequency of the low-value practices measurement and have proved interventions to reduce them. These findings provide a new perspective about the consequences of low-value practices for the patients and health care. Ignoring DNDs could place patients at unnecessary risk. This study is in addition to others that pursue to reduce patient harm as a consequence of inefficiency care due to overuse^{5,9,10,12,16}: in this case, describing the magnitude of the problem in primary care and encouraging the deimplementation strategies that are coming into play.

These results are suggesting that approximately half of the patients included in this study received treatment or diagnostic test that should not have been indicated to them. Approximately, 1 in

TABLE 2. Extent to Which the AE Was Related to Ignoring DNDs

	GP (54 AAEs)	% (95% CI)	PED (15 AAEs)	% (95% CI)
Ignoring DNDs is probably one of the causes of the AAE.	21	38.9 (25.9–51.9)	6	40.0 (15.2–64.8)
Ignoring DNDs has probably caused this AAE.	15	27.8 (15.8–39.7)	9	60.0 (35.2–84.8)
Complete assurance that Ignoring DNDs is one of the causes of this AAE.	14	25.9 (14.2–37.6)	0	0
Complete assurance that Ignoring DNDs is the only cause of this AAE.	4	7.4 (0.4–14.4)	0	0

TABLE 4. Number of AAEs Related for Every DND Comparing Total, Males, and Females (Adult Patients/GPs)

	No. Medical Records in Which This DND Was Identified, n/N (%)	No. Patients Suffering From AAE Related to This DND, n/N (%)
Use benzodiazepines for the treatment of insomnia in people older than 65 y (n = 1401)		
Females	175/254 (68.9)	13/21 (61.9)
Males	79/245 (32.2)	8/21 (38.1)
Total	254/1401 (18.1)	21/254 (8.3)
Prescribe nonsteroidal anti-inflammatory drugs to patients with high blood pressure, heart failure, chronic kidney disease, or liver cirrhosis (n = 1928)		
Females	179/314 (57.0)	11 (64.7)
Males	135/314 (43.0)	6/11 (54.5)
Total	314/1928 (16.3)	17/314 (5.4)
Starter kit paracetamol in doses of 1 g (n = 1928)		
Females	343/602 (57.0)	2/6 (33.3)
Males	259/602 (43.0)	4/6 (66.7)
Total	602/1928 (31.2)	6/602 (1.0)
Indicate antibiotic treatment in acute bronchitis when the patient does not have COPD, heart failure, diabetes, pneumonia, tonsillitis, <i>Bordetella</i> infection, or kidney disease or is undergoing active chemotherapy (n = 1928)		
Females	71/117 (60.7)	4/6 (66.7)
Males	46/117 (39.3)	2/6 (33.3)
Total	117/1928 (6.1)	6/117 (5.1)
Prescribe lipid-lowering agents in patients older than 75 y without previous cardiovascular events (n = 437)		
Females	47/69 (68.1)	1/1 (100)
Males	22/69 (31.9)	0 (0)
Total	69/437 (15.8)	1/69 (1.4)
Screening asymptomatic patients older than 50 y for prostate cancer using PSA (n = 1648)		
Males	99/1648 (6.0)	0 (0)
Perform imaging tests in nonspecific low back pain without warning signs before 6 wks (n = 1928)		
Females	29/52 (55.8)	1/3 (33.3)
Males	23/52 (44.2)	2/3 (66.7)
Total	52/1928 (2.7)	3/52 (5.8)

COPD, chronic obstructive pulmonary disease.

TABLE 5. Number of AAEs for Every DND Comparing Total, Boys, and Girls (Pediatric Population)

	No. Medical Records in Which This DND Was Identified, n/N (%)	No. Patients Suffering From AAE Related to This DND, n/N (%)
Do not prescribe antibiotics for pharyngitis or tonsillitis, even if the patient does not test positive for streptococcus		
Females	67/141 (47.5)	7/13 (53.8)
Males	74/141 (52.5)	6/13 (46.2)
Total	141/629 (22.4)	13/141 (9.2)
Do not prescribe mucolytics. or antibiotics for respiratory tract infections		
Females	57/114 (50.0)	0 (0)
Males	57/114 (50.0)	2/2 (100)
Total	114/629 (18.1)	2 (1.8)
Do not combine or alternate treatment with ibuprofen and acetaminophen		
Females	48/97 (49.5)	0 (0)
Males	49/97 (50.5)	0 (0)
Total	97/629 (15.4)	0 (0)

n = 629.

40 of the total patients who were attended in primary care could suffer from an AAE related to such low-value care. Among the pediatric patients, the AEs were slightly higher in number but less severe than those suffered by the adult patients.

These data, in conjunction with those of an Australian study that analyzed the harm related to the selection of low-value care in 225 public hospitals in New South Wales,¹⁹ provide a new reason for tackling the problem of overuse: it causes avoidable harm to patients. Attending to such harm increases the cost of health interventions. Such resources must not be exhausted for repairing the damage related to doing what should not have been done.

Low-value practices are not only a burden in economic terms. Reducing practices such as those studied here has also the potential to improve outcomes for the patients. Because GPs are located at the starting point of the care process, their decisions can determine the quality of care received.

The potential impact of low-value care on patient safety can be ruled out in light of these findings. Decisions made by doctors in primary care that ignore the principles of the right care could have a negative effect on patients. In some cases, if the patient perceives that the harm could have been avoided, it may contribute to a loss of trust in the physician.²⁷ If one also considers the unnecessary overall cost to the health system, which is financed via taxes in Spain, it is clear that reducing overuse and eradicating practices such as those studied here are priority objectives for health authorities and managers.

The DNDs analyzed in this study are similar to those selected in other studies and are recognized as targets for enhancing the quality of care either to analyze the frequency of overuse²⁸ or to prioritize interventions designed to reduce overuse.²⁹ Thus, finding effective methods to reduce overutilization is necessary.

To reduce low-value care, various deimplementation strategies have been designed^{30,31}; however, professionals should be aware of such initiatives. In Spain, this knowledge can be improved and should be an objective of safety policies. Furthermore, it is also necessary that patients who demand treatment or diagnostic tests know that low-value care does not offer significant benefits and can have a negative impact on their safety.

Limitations and Potential Sources of Bias

This study aimed to identify the frequency and severity of, but not the causes of, overuse related to the DNDs, which may not always be clear-cut cases of overuse. The study design, based on the review of medical records, did not permit us to establish that doing what must not be done by GPs or pediatricians is a direct cause for the occurrence of AEs. However, it is conceivable that if the DND had not been ignored, the AAE would have been less likely to occur.

Our analysis is based on patients' clinical records; however, the quality of the registered information can vary across physicians. The magnitude of harm related to not adhering to DNDs can vary from mild to severe, thereby introducing a detection bias. It is difficult to determine some of the consequences of AEs (e.g., unnecessary antimicrobial treatment) for only one patient. This study adjudicates whether AEs were avoidable using only chart review. The figure of patients receiving treatments included in the DNDs was limited to the 10 recommendations analyzed. The current data could be worse if additional DNDs were also considered.

Practical Implications

These findings suggest that one measure of the impact of interventions aiming to reduce overuse may lie in the extent of damage related to low-value care. Low-value care can be classified into 3

categories³²: ineffective, inefficient, and unwanted care (care that does not solve the patient's problem patient or meet their preferences). Given the results, a cross-cutting classification axis could be considered to complement the findings and their impact on patient safety. This new information could be used to prioritize deimplementation interventions.³⁰

Future Studies

Female patients underwent a greater number of treatments that ignored DNDs, a finding that requires further attention. The safety events considered in this study have exclusively been focused on physical consequences for patients in the short-term. Other negative consequences from overused services, such as psychological, social, financial, treatment burden, and dissatisfaction with health care,³³ should be explored. Furthermore, long-term consequences should be explored. The present findings should be complemented by analyses of patient information regarding safety incidents³⁴ and the use of artificial intelligence techniques to enhance the identification of safety incidents.

ACKNOWLEDGMENTS

Technical personnel in charge of the health information systems of the health services that have participated in the study have collaborated selflessly and made this study possible.

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