



End-of-life care in a cardiology department: have we improved?

Juan Ruiz-García^{1,2,3,*}, Pablo Díez-Villanueva^{1,4,*}, Ana Ayesta¹, Vanessa Bruña¹,
Lourdes M Figueiras-Graillet¹, Laura Gallego-Parra⁵, Francisco Fernández-Avilés^{1,6},
Manuel Martínez-Sellés^{1,6,7}

¹Department of Cardiology, Hospital General Universitario Gregorio Marañón, Calle Doctor Esquerdo, Madrid, Spain

²Department of Cardiology, Hospital Universitario de Torrejón, Calle Mateo Inurria, Torrejón de Ardoz, Madrid, Spain

³Universidad Francisco de Vitoria, Carretera Pozuelo a Majadahonda, Pozuelo de Alarcón, Madrid, Spain

⁴Department of Cardiology, Hospital Universitario de la Princesa, Calle de Diego de León, Madrid, Spain

⁵Department of Cardiology, Hospital Universitario del Sureste, Ronda del Sur, Arganda del Rey, Madrid, Spain

⁶Universidad Complutense de Madrid, Av. Seneca, Madrid, Spain

⁷Universidad Europea de Madrid, Urbanización El Bosque Calle Tajo, Villaviciosa de Odón, Madrid, Spain

Abstract

Background End-of-life care is not usually a priority in cardiology departments. We sought to evaluate the changes in end-of-life care after the introduction of a do-not-resuscitate (DNR) order protocol. **Methods & Results** Retrospective analysis of all deaths in a cardiology department in two periods, before and after the introduction of the protocol. Comparison of demographic characteristics, use of DNR orders, and end-of-life care issues between both periods, according to the presence in the second period of the new DNR sheet (Group A), a conventional DNR order (Group B) or the absence of any DNR order (Group C). The number of deaths was similar in both periods ($n = 198$ vs. $n = 197$). The rate of patients dying with a DNR order increased significantly (57.1% vs. 68.5%; $P = 0.02$). Only 4% of patients in both periods were aware of the decision taken about cardiopulmonary resuscitation. Patients in Group A received the DNR order one day earlier, and 24.5% received it within the first 24 h of admission (vs. 2.6% in the first period; $P < 0.001$). All patients in Group A with an implantable cardioverter defibrillator (ICD) had shock therapies deactivated (vs. 25.0% in the first period; $P = 0.02$). **Conclusions** The introduction of a DNR order protocol may improve end-of-life care in cardiac patients by increasing the use and shortening the time of registration of DNR orders. It may also contribute to increase ICD deactivation in patients with these orders in place. However, the introduction of the sheet in late stages of the disease failed to improve patient participation.

J Geriatr Cardiol 2016; 13: 587–592. doi:10.11909/j.issn.1671-5411.2016.07.012

Keywords: Cardiology; Cardiopulmonary resuscitation; End-of-life; Palliative care

1 Introduction

Cardiology is directly involved in the diagnosis and treatment of the leading causes of death.^[1] Heart failure is the common end-stage of many cardiovascular diseases and, despite dramatic improvement in its outcome, admission rates following heart failure hospitalization remains high, with 50% of all cardiovascular readmissions occurring within the two months before death.^[2] However, the atten-

tion given by cardiologists and cardiology guidelines to end-of-life care is frequently marginal.^[3–5]

Given the broad scope and significance of these problems, all physicians treating patients with cardiovascular diseases should be prepared to plan and optimize end-of-life care. For this purpose open and frequent communication about patients expectations and needs is mandatory.^[4,5] The do-not-resuscitate (DNR) order is the expression of the patient's right to refuse cardiopulmonary resuscitation (CPR) in case of cardiac arrest, thus avoiding the negative consequences that might result from it (i.e., prolonging suffering, neurological damage).^[6] In cardiology, the use of these DNR orders and end-of-life management are less widespread than in other medical specialities.^[7,8]

Actions and instruments aimed at increasing the awareness and the involvement of cardiologists in end-of-life care

*The first two authors contributed equally to this article.

Correspondence to: Manuel Martínez-Sellés, MD, PhD, Cardiology Department, Hospital General Universitario Gregorio Marañón, Calle Doctor Esquerdo 46, 28007 Madrid, Spain. E-mail: mmselles@secardiologia.es

Telephone: +34-915-868286

Fax: +34-915-868287

Received: February 8, 2016

Revised: April 13, 2016

Accepted: May 12, 2016

Published online: July 28, 2016

may contribute to match the wishes and improve the experiences of large number of patients in the last days of their lives. Five years ago we reported the result of the analysis of all patients consecutively dying during 26 months in our cardiology department.^[9] After analysis, we decided to improve the care provided to our patients in the final moments of their lives by developing and implementing a DNR order and palliative care protocol. We present below the new analysis of all patients dying in the same cardiology department during the 26 months that followed the intervention, highlighting the changes achieved in end-of-life care.

2 Methods

2.1 Design and development of a new DNR sheet

After detailed discussion of the data extracted from the analysis of the previous situation, we proposed the creation a formal DNR sheet. Each of the questions shown in a first draft was evaluated and discussed by all cardiologists during different clinical sessions. All comments, suggestions and objections made were collected and the protocol sheet was modified accordingly. Prior to its use, the sheet was evaluated and approved by the ethics committee of our hospital. The protocol sheet was strongly recommended although it's use is not mandatory. The *Orange Sheet* (colloquial name given because of the color of the paper where is printed) began to be used in our department in May 2010, and until the date of submission of this article continues to be used in the same format without further modifications (Online data Supplement 1).

The sheet is always located on the front page of the medical records of the patient. Besides being a marker for health professionals not to start CPR if the patient suffered a cardiopulmonary arrest (CPA), the *Orange Sheet* also indicates the time, and reasons or symptoms for the DNR order. It includes another sections with questions, alternatives or actions to be considered after the establishment of the DNR order (e.g., spiritual needs, analgesic or anxiolytic drugs, etc.). The sheet offers the possibility of reviewing or revoking the order due to changes in the clinical status and/or changes in the patient's or family's wishes.

2.2 Analysis of the use of the new DNR sheet

In order to assess the degree of implementation and the impact of the new DNR sheet, a retrospective analysis of all consecutive patients dying in our department between May 2010 and June 2012 was performed. Deaths were classified into three groups according to the presence in the clinical history of the new protocol sheet (Group A), a conventional DNR order (Group B), or the absence of any DNR order

(Group C). In our hospital, previous conventional DNR order (Group B) was a simple handwritten note in the clinical history of patients indicating "not to start CPR in case of CPA". The differences between groups and between patients dying in both periods (January 2007—February 2009 and May 2010—June 2012) were analyzed. We focused special attention on the care received by patients in Group A.

2.3 Statistical analysis

Data are presented as the mean \pm SD for continuous variables and as proportions for categorical variables. Mean values of continuous variables were compared with Student *t* test and one-way Analysis of Variance (ANOVA). Categorical variables were compared with the chi-square test, or the Fisher exact test, when the chi-square test was not appropriate. All statistical analyses were performed with SPSS software (SPSS V16, Chicago, Illinois, USA). All *P*-values are 2-tailed.

3 Results

In the period between May 2010 and June 2012, a total of 197 deaths took place in our cardiology department. A DNR order written before such death was found in 135 patients (69%) (Figure 1). Table 1 shows the clinical characteristics according to the presence or absence of a DNR order. Differences in the same clinical characteristics between Group A and B are analyzed in Table 2. Median time between the protocol sheet filling and the patient's death was 2 days [interquartile range (IQR): 1–5 days]. In 21 of the 53

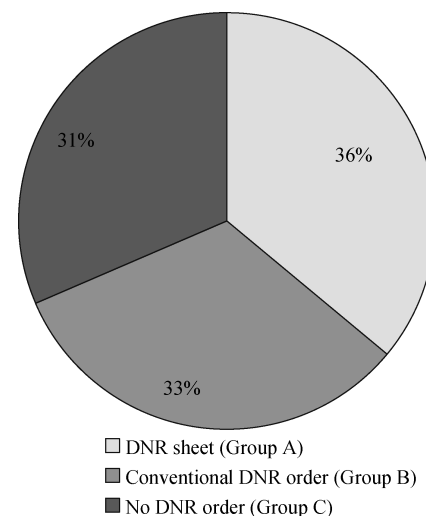


Figure 1. Distribution of 197 deaths occurring between May 2010 and June 2012 according to the presence or absence of a DNR order. DNR: do-not-resuscitate.

Table 1. Clinical characteristics of the total deaths taken place between May 2010 and June 2012.

	Total (n = 197)	DNR order in place (n = 135)		P
		Group A + B	No DNR order (n = 62) Group C	
Age, yrs	75 ± 13.9	76 ± 15.6	73 ± 10.5	0.17
Female gender	73 (37%)	46 (34%)	27 (44%)	0.20
Hypertension	136 (69%)	93 (69%)	43 (71%)	0.88
Diabetes mellitus	70 (36%)	50 (37%)	20 (33%)	0.54
Smoking	34 (17%)	26 (19%)	8 (13%)	0.28
Dyslipidemia	94 (48%)	63 (47%)	31 (51%)	0.62
Obesity	28 (14%)	21 (16%)	7 (12%)	0.44
Heart disease	127 (64%)	94 (70%)	33 (54%)	0.03
ICD	16 (8%)	14 (10%)	2 (3%)	0.38
COPD	32 (16%)	23 (17%)	9 (15%)	0.67
Renal insufficiency	108 (55%)	79 (59%)	29 (48%)	0.14
Peripheral vascular disease	31 (16%)	20 (15%)	11 (18%)	0.58
Cerebrovascular disease	22 (11%)	16 (12%)	6 (10%)	0.67
Dementia	15 (8%)	11 (8%)	4 (7%)	0.69
Cancer	15 (8%)	13 (10%)	2 (3%)	0.12

Data are presented as n (%) or mean ± SD. COPD: chronic obstructive pulmonary disease; DNR: do-not-resuscitate; ICD: implantable cardiac defibrillator.

Table 2. Clinical characteristics of patients who died from May 2010 to June 2012 based on the presence of the new DNR sheet (Group A) or a conventional DNR (Group B).

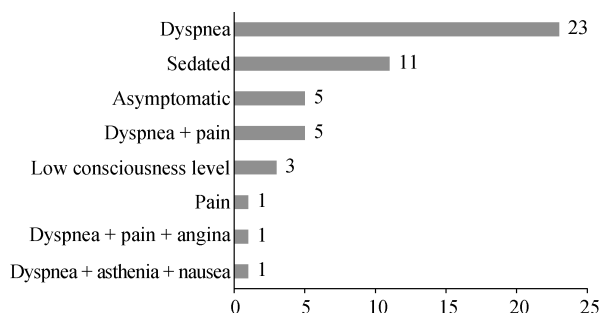
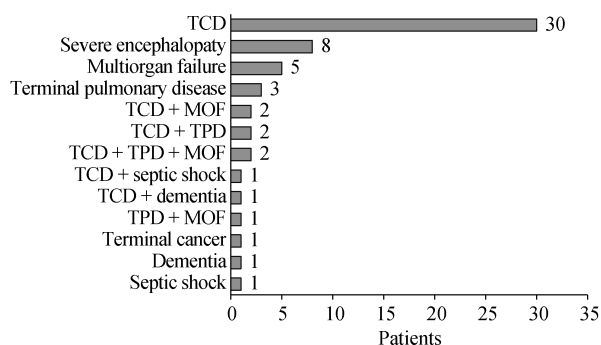
	DNR sheet (n = 71)		P
	Group A	Conventional DNR order (n = 64) Group B	
Age, yrs	77 ± 10.5	73.9 ± 12.6	0.10
Female gender	30 (42%)	16 (25%)	0.04
Hypertension	48 (68%)	45 (70%)	0.60
Diabetes mellitus	25 (35%)	25 (39%)	0.60
Smoking	16 (23%)	10 (16%)	0.30
Dyslipidemia	30 (42%)	33 (52%)	0.20
Obesity	10 (14%)	11 (17%)	0.60
Heart disease	55 (78%)	39 (61%)	0.05
ICD	8 (11%)	6 (9%)	0.40
COPD	11 (16%)	12 (19%)	0.60
Renal insufficiency	43 (61%)	36 (56%)	0.70
Peripheral vascular disease	10 (14%)	10 (16%)	0.80
Cerebrovascular disease	9 (13%)	7 (11%)	0.80
Dementia	7 (10%)	4 (6%)	0.50
Cancer	8 (11%)	5 (8%)	0.50

Data are presented as n (%) or mean ± SD. COPD: chronic obstructive pulmonary disease; DNR: do-not-resuscitate; ICD: implantable cardiac defibrillator.

patients (40%) with available information regarding DNR signature date, the sheet was filled in the last 48 hours of their lives. We did not find any DNR order revoked. The doctor who took the decision to complete and sign the DNR

sheet was the cardiologist in charge of the daily care of the patient in all but four cases. In the 52 DNR sheets, where was indicated whether the DNR order had been agreed with the patient or the family, consensus was achieved with 47 families (90%) but only with two patients (4%). Regarding previous patient's wishes about resuscitation and end-of-life care, no patient had a written living will. In six patients was possible to identify wishes verbally expressed in advance. The symptoms of the patients at the time of the DNR sheet filling are shown in Figure 2. More than one advanced-stage condition was present in 9 (15.6%) patients before the DNR order (Figure 3).

Palliative actions or measures to improve comfort were indicated in the protocol sheet of 25 patients (35.2%) of Group A (Figure 4). In 16 of the 30 patients (53.3%) suffering from dyspnea, a perfusion of morphine or benzodiazepine was initiated. A total of 4 of the 7 patients (57.1%) symptomatic for pain received a perfusion of morphine and/or had non-opioid analgesia increased. Figure 5 shows palliative measures implemented and withdrawn treatments in Group A. We only found one palliative measure in the clinical records of the 64 patients dying with a conventional

**Figure 2. Symptoms of patients at the time of filling the DNR sheet.** Data are expressed as symptom, n. DNR: do-not-resuscitate.**Figure 3. Main clinical reason for considering patients dying with the DNR sheet not to be resuscitated.** DNR: do-not-resuscitate; MOF: multiorgan failure; TCD: terminal cardiac disease; TPD: terminal pulmonary disease.

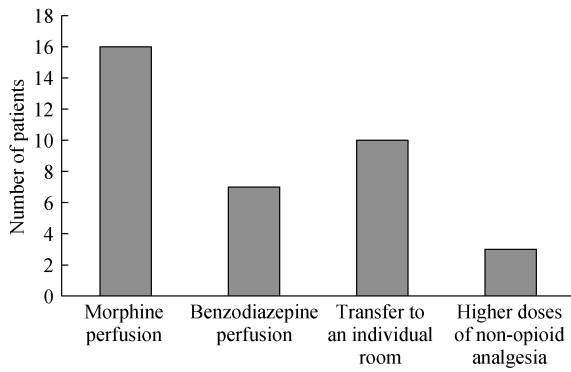


Figure 4. Actions taken after filling the DNR sheet. DNR: do-not-resuscitate.

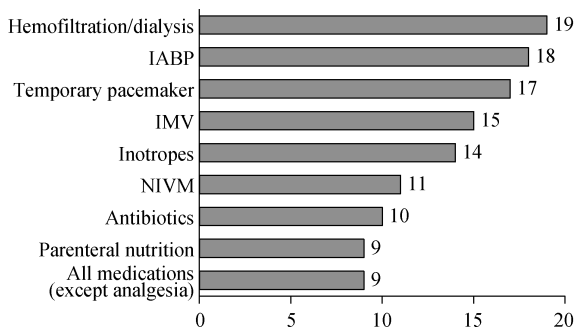


Figure 5. Number of patients in whom certain measures or treatments were limited after signing the DNR sheet. DNR: do-not-resuscitate; IABP: intra-aortic balloon pump; IMV: invasive mechanical ventilation; NIMV: noninvasive mechanical ventilation.

DNR (Group B): a morphine perfusion. In 34 patients (53.1%) of this group a reference regarding the limitation of the therapeutic effort was found. In 9 patients “it was decided not to carry out invasive measures” while in another 25 patients it was stated that “limitation of treatment” was done.

In the two periods analyzed, both of 26 months, the number of deaths in our cardiology department was very similar: 198 in the first period (from January 2007 to February 2009) and 197 in the second (from May 2010 to June 2012). With respect to the baseline characteristics of the patients dying in these periods, a higher prevalence of smoking and previous heart disease, but reduced presence of dyslipidemia and renal failure was found in the first group (Table 3). Despite the short time between both analyses, it was possible to demonstrate a significant increase in the use of DNR orders; the rate of deaths preceded by a DNR order increased from 57.1% to 68.5% ($P = 0.02$). Regarding differences in clinical characteristics between patients dying with a DNR order in the first period and those dying with the new protocol sheet (Group A), only a higher prevalence of

Table 3. Comparison of the clinical features of the total deaths in both periods.

	2007–2009 (n = 198)	2010–2012 (n = 197)	P
Age, yrs	76.3 ± 10.5	75 ± 13.9	0.29
Female gender	93 (47%)	73 (37%)	0.06
Hypertension	145 (73%)	136 (69%)	0.42
Diabetes mellitus	76 (38%)	70 (36%)	0.63
Smoking	64 (32%)	34 (17%)	< 0.001
Dyslipidemia	74 (37%)	94 (48%)	0.05
Obesity	21 (11%)	28 (14%)	0.35
Heart disease	165 (83%)	127 (64%)	< 0.001
ICD	9 (5%)	16 (8%)	0.21
COPD	33 (17%)	32 (16%)	0.91
Renal insufficiency	64 (33%)	108 (55%)	< 0.001
Peripheral vascular disease	30 (15%)	31 (16%)	0.98
Cerebrovascular disease	28 (14%)	22 (11%)	0.46
Dementia	20 (10%)	15 (8%)	0.49
Cancer	27 (14%)	15 (8%)	0.08

Data are presented as n (%) or mean ± SD. COPD: chronic obstructive pulmonary disease; ICD: implantable cardiac defibrillator.

renal insufficiency was found in the second group (Table 4). A higher precocity in the decision of DNR was observed in Group A. In the first period, the median time from admission to the DNR order was 7 days (IQR: 3–21 days), but patients in Group A had it one day before (median of 6 days (IQR: 2–15 days). Furthermore, although only 2.6% patients in the first period received the DNR order in the first 24 hours of admission, 24.5% had it at that time in Group A ($P < 0.001$). Both in the first period and in Group A, only 4% of patients were aware of the decision not-to-resuscitate. The level of information and consensus with the family was also similar (84.1% families in the first period vs. 90.4% in Group A; $P = 0.40$). Regarding patients dying with an implantable cardioverter defibrillator (ICD) and a DNR order in place, only one patient from the first period (25.0%) had it deactivated, while this action was performed in the 8 patients in Group A (100%) ($P = 0.02$) (Figure 6).

4 Discussion

In this study, we have shown how a simple and generalizable tool might change the use of the DNR orders and the end-of-life care in a cardiology department. Our protocol increased the use of DNR orders and promoted ICD deactivation. However, our analysis confirms the broad effort that is still needed to improve care of patients with an end-stage cardiovascular disease.

4.1 Use of DNR orders

Throughout our study we have seen a significant change

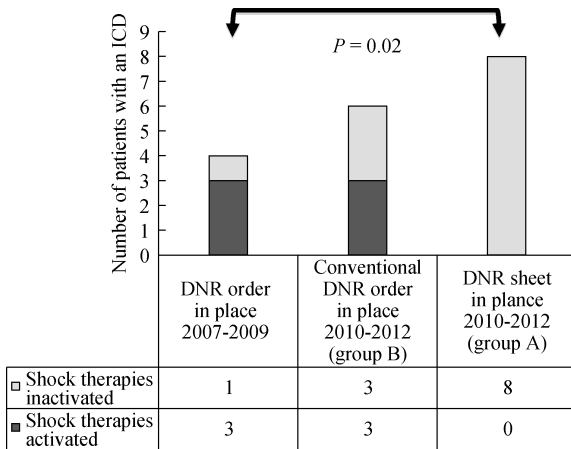


Figure 6. Patients with an implantable cardioverter defibrillator having their shock therapy disconnected after the DNR order. DNR: do-not-resuscitate; ICD: implantable cardiac defibrillator.

in the percentage of deaths preceded by a DNR order, increasing from 57% in 2007–2009 to 69% in 2010–2012. This time course is similar to the trend observed over the last decade in other departments.^[10] However, although this change cannot totally be attributed to the intervention performed, we believe that given the few months between both analyzes and the small differences in the baseline characteristics of the patients, it is very likely that at least it has been influenced by it.

Obviously, the purpose of our intervention, or any other seeking to improve the attention to patients with advanced-phase cardiovascular diseases, is not to achieve all deaths preceded by a DNR order, as unexpected or unpredictable deaths will always take place. Besides, there are patients who, despite having all the necessary information about their clinical situation, will prefer to be considered for CPR in case of cardiac arrest. Our goal should be to give all patients the opportunity to express their wishes about CPR. In this regard, we want to emphasize the absolute lack of patient involvement in the decisions that affect decision-making in the final stages of their disease. However, in advanced stages it is likely that patients are not capable of taking decisions or even are not interested in doing it.^[11,12] As an example, in our study 11 patients in Group A were already sedated at the time of the DNR order. Obviously these reasons cannot justify the extremely low participation of patients (4%) in the DNR decision observed in both periods. In fact, our results support that DNR orders are frequently more a marker of clinical deterioration than the true result of a consented desired decision.^[13,14]

Regarding the delay in decision-making, we consider positive the one-day reduction in the median time from admission to DNR sheet registration, being even more en-

couraging the significant increase in the percentage of patients who received the DNR order in the first 24 h of hospital admission. However, although the DNR sheet did not improve patient participation, we still consider that it positively modify the use of DNR order. For example, given its easily identifiable format (orange sheet) and its constant location (always at the beginning of the clinical history of the patient), it facilitates its fast recognition by all staff in case of cardiac arrest. In the first period, the location of the DNR order was not constant; sometimes it was registered in the daily medical notes, while in other times it was in the nursing notes. Something similar happened in patients from Group B.

4.2 Management of ICD at the end of life

It is increasingly common to find terminally ill cardiac and non-cardiac-patients carrying an ICD. Almost one third of these patients will receive an electric shock in their last 24 h of life,^[15] even though, the cause of death is not related with arrhythmias. The recent study of Kinch Westerdahl, et al.^[15] showed that although a majority (52%) of patients with ICD had a DNR order in place, 65% of them continued to have their defibrillation therapies activated 24 h before death, and 24% had one or multiple shocks in the last day of life. This is contrary to the recommendations given by current clinical guidelines.^[3-5,16] Given these data, we believe that we can be pleased with the fact that all patients carrying an ICD and dying with a DNR sheet (Group A) had their shock therapies inactivated.

It is also very likely that at the end stage of many diseases, the medical attention may focus on clinical aspects of the illness; so, unless in the case of an electric shock, the presence of an ICD could often pass unnoticed for doctors who are taking care of the patient, even more if they are not cardiologists. We consider that the idea of including in the protocol sheet a section regarding the possible presence of an ICD might be incorporated to the DNR orders used in other departments. At this point, it should also be useful to remember that conversations with patients regarding possible ICD deactivation should start even before ICD implantation.^[16]

4.3 End-of-life care

In many cases there is a risk of misinterpreting a DNR order,^[14] and so it might not seem appropriate to include in the same DNR sheet a list of palliative measures, or treatments to withdraw. But because the hospital environment for which we develop our tool and the observed delay in applying these DNR orders, we decided to include those options in the DNR sheet in order to improve the correlation between the patient wishes and the care plan, thus avoiding the overuse of invasive treatments and the underuse of palliative care observed in the first period. We also believe that

including in the DNR sheet a question about the patient's symptoms at the time of the registration of the DRN order, improved the medical care provided to these symptoms. In fact, the majority of patients in Group A received, at least, a palliative measure. However, we were only able to identify one comfort measure in the medical records of the 64 patients from Group B.

Another important point that should always be considered in patients at end stages of many diseases is if there are treatments that should not be initiated or withdrawn.^[17] Regarding this question we have also achieved partial improvement with the use of our DNR sheet. Patients in Group B were only generically cataloged with sentences like "it was decided not to carry out invasive measures" or perform "limitation of treatment", without detailing the measures that were decided to limit. Meanwhile, in patients who died with the DNR sheet (Group A), it was clearly stated what treatments were limited or withdrawn, and what palliative/comfort measures were decided to start or continue.

4.4 Limitations

This paper suffers from the limitations and biases inherent in all retrospective analysis. It should also be remembered that is a single-center study taking place in a cardiology department of a tertiary university hospital, so the conclusions should be extrapolated with caution to other departments and hospitals. However, to the best of our knowledge, there are no previous data regarding the effect of protocols involving DNR orders and end-of-life care in patients dying in cardiology departments.

4.5 Conclusions

A DNR and palliative care protocol sheet improved end-of-life care, increased the use of DNR and reduced the time till an order is implemented in a cardiology department. Moreover, this cheap and easy-to-implement intervention increased ICDs deactivation in patients with DNR orders. The introduction of the protocol sheet failed to improve patient participation.

References

- Mozaffarian D, Benjamin EJ, Go AS, et al. Heart Disease and Stroke Statistics-2015 Update: A report from the American Heart Association. *Circulation* 2015; 131: e29–e322.
- Desai AS, Stevenson LW. Rehospitalization for heart failure: predict or prevent? *Circulation* 2012; 126: 501–506.
- Jaarsma T, Beattie JM, Ryder M, et al; Advanced Heart Failure Study Group of the HFA of the ESC. Palliative care in heart failure: a position statement from the palliative care workshop of the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 2009; 11: 433–443.
- Allen LA, Stevenson LW, Grady KL, et al; American Heart Association; Council on Quality of Care and Outcomes Research; Council on Cardiovascular Nursing, Council on Clinical Cardiology; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular Surgery and Anesthesia. Decision making in advanced heart failure: a scientific statement from the American Heart Association. *Circulation* 2012; 125: 1928–1952.
- Whellan DJ, Goodlin SJ, Dickinson MG, et al; Quality of Care Committee; Heart Failure Society of America. End-of-life care in patients with heart failure. *J Card Fail* 2014; 20: 121–134.
- Loertscher L, Reed DA, Bannon MP, Mueller PS. Cardiopulmonary resuscitation and do-not-resuscitate orders: a guide for clinicians. *Am J Med* 2010; 123: 4–9.
- Kelly WF, Eliasson AH, Stocker DJ, Hnatiuk OW. Do specialists differ on do-not-resuscitate decisions? *Chest* 2002; 121: 957–963.
- Dunlay SM, Foxen JL, Cole T, et al. A survey of clinician attitudes and self-reported practices regarding end-of-life care in heart failure. *Palliat Med* 2015; 29: 260–267.
- Martínez-Sellés M, Gallego L, Ruiz J, et al. Do-not-resuscitate orders and palliative care in patients who die in cardiology departments. What can be improved? *Rev Esp Cardiol* 2010; 63: 233–237.
- Formiga F, Olmedo C, López-Soto A, et al. Dying in hospital of terminal heart failure or severe dementia: the circumstances associated with death and the opinions of caregivers. *Palliat Med* 2007; 21: 35–40.
- Silveira MJ, Kim SYH, Langa KM. Advance directives and outcomes of surrogate decision making before death. *N Engl J Med* 2010; 362: 1211–1218.
- Hofmann JC, Wenger NS, Davis RB, et al. Patient preferences for communication with physicians about end-of-life decisions. SUPPORT Investigators. Study to Understand Prognoses and Preference for Outcomes and Risks of Treatment. *Ann Intern Med* 1997; 127: 1–12.
- Morrell ED, Brown BP, Qi R, et al. The do-not-resuscitate order: associations with advance directives, physician specialty and documentation of discussion 15 years after the patient self-determination Act. *J Med Ethics* 2008; 34: 642–647.
- Saczynski JS, Gabbay E, McManus DD, et al. Increase in the proportion of patients hospitalized with acute myocardial infarction with do-not-resuscitate orders already in place between 2001 and 2007: a nonconcurrent prospective study. *Clin Epidemiol* 2012; 4: 267–274.
- Kinch Westerdahl A, Sjöblom J, Mattiasson AC, et al. Implantable cardioverter-defibrillator therapy before death: high risk for painful shocks at end of life. *Circulation* 2014; 129: 422–429.
- Datino T, Rexach L, Vidán MT, et al. Guidelines on the management of implantable cardioverter defibrillators at the end of life. *Rev Clin Esp* 2014; 214: 31–37.
- Herreros B, Palacios G, Pacho E. Limitation of the therapeutic effort. *Rev Clin Esp* 2012; 212: 134–140.