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Impact of intervention aimed at improving the integration of oncology units and local palliative care services: results of the multicentre prospective sequential MIRTO study

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ABSTRACT

Background Chemotherapy (CT) in patients with advanced cancer (ACP) near the end of life is an increasing practice of oncology units. A closer integration with palliative care (PC) services could reduce the use of potentially harmful CT. This prospective study is aimed at assessing whether a more integrated care model could reduce CT use near the end of life and increase local PC service utilisation.

Methods The study enrolled sequentially two cohorts of ACP with an estimated life expectancy of ≤6 months. In the first cohort, the usual oncologist's practice to prescribe CT and to activate local PC services were recorded. In cohort 2, the oncologist's decision was taken after an in-hospital consultation with the local PC teams. After patient death, a follow-back survey was carried out.

Results The two cohorts included 109 and 125 evaluable patients, respectively. The oncologist's decision to prescribe CT occurred in 51.4% and 60%, respectively: the percentages of patients receiving the final CT administration in the last 30 days of life did not differ in the two cohorts (33.9% and 29.3%, respectively,p=0.83). Conversely, an increase in home PC service utilisation (from 56.9% to 82.4%, p=0.00), at home deaths (from 40.4% to 56.8%, p=0.01) and in-hospice deaths (from 8.3% to 19.2%, p=0.00) occurred in cohort 2.

Conclusion The implementation of an initial in-hospital consultation of oncologists and experienced home PC teams has not reduced the use of CT near the end of life but increased PC service utilisation and reduced in-hospital deaths.

Key questions

What is already known about this subject?

- Chemotherapy in patients with advanced cancer near the end of life is an increasing practice of oncology units. A closer integration with palliative care (PC) services could reduce the use of potentially harmful treatments.

What does this study add?

- The MIRTO (Migliorare l'appropriatezza di uso della terapia antitumorale e l'integrazione tra Oncologia Medica e Cure Palliative nei pazienti oncologici in fase avanzata con attesa di vita breve) study shows that the introduction of an initial in-hospital meeting involving oncologists and expert professionals of the local PC network in order to improve the integration of oncology and PC was not able to reduce the use of chemotherapy near the end of life but was associated with a significant increase of the local PC service use together with home and hospice deaths.

How might this impact on clinical practice?

- Having expert territorial PC teams favours dehospitalisation of patients with cancer who have short life expectancy. A greater commitment of the competent institutions is necessary to further educate oncologists to a more comprehensive view of patients in order to promote an appropriate and wise use of anticancer treatments near the end of life.

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INTRODUCTION

The use of chemotherapy (CT) in the last weeks of life is considered by many authors to be one of the indicators of therapeutic aggressiveness because of its negligible clinical benefit together with potentially serious toxic effects with a substantial risk of exacerbating patient and family suffering, as well as being responsible for raising the costs for health systems.[1–3] CT in terminally ill patients with cancer was reported to be associated with worsened quality of life[4] and an increased risk of undergoing cardiopulmonary resuscitation, mechanical ventilation or both and of dying in an intensive care unit.[5] The insistence in the potentially harmful prescription of cancer treatments in this clinical setting can find a viable alternative in the timely activation of palliative care (PC) services.[6]

In a previous retrospective study carried out in the metropolitan area of Bologna, Italy in the period spanning from 2003 to 2005, 22.7% of patients who had been treated with at least one CT line for advanced disease had received the last CT in the last month of life.[7] Other authors have reported similar observations with a CT administration rate in the last month of life around 20%–25%,[8–12] with peaks up to 45% as in the case of non-small-cell lung cancer.[13] Recently, an excessive use of CT near the end of life has also been reported in countries with low availability of PC resources.[14 15]

The finding that almost a quarter of patients with advanced cancer (ACP) treated with CT had pursued the treatment in the last month of their lives, despite the presence of experienced home PC services and inpatients hospices in our territory, has led us to design a prospective multicenter study, called MIRTO (Migliorare l'appropriatezza di uso della terapia antitumorale e l'integrazione tra Oncologia Medica e Cure Palliative nei pazienti oncologici in fase avanzata con attesa di vita breve), which was intended to assess the impact of a closer integrated model of hospital care and local PC services on the use of CT at the end of life and on PC service utilisation. The implementation of this model was expected to create a more integrated care pathway in which cancer treatment continued to be administered in the hospital and, at the same time, supportive and PC were provided for at home or in hospice, ensuring and enhancing the continuity of care and promoting the gradual detachment of the patient from the hospital care enviroment. The present prospective, sequential cohort study aimed at assessing whether this new integrated care model could reduce CT use near the end of life and increase local PC service utilisation.

PATIENTS AND METHODS

MIRTO is a clinical study involving the Oncology Units of the University Hospitals of Bologna and Ferrara, Italy. At the same time, the study engaged the local PC network represented by home care services and in-patient hospices. In this geographical area, the PC network also includes non-profit private organisations that operate under agreement with the Regional Emilia-Romagna Health System. Such organisations are mainly represented by the Assistenza Nazionale Tumori (ANT) Foundation,[16] which has promoted and managed for over 30 years a national advanced oncological home care program, particularly active in the Bologna province, and the Seràgnoli Hospice Foundation, which has managed for over 15 years hospice facilities in the province of Bologna.[17] The MIRTO study was funded by the University-Region 2007–2009 Research Program (Area 2 – Clinical Governance) of the Emilia-Romagna region. The study was approved by Ethics Committees of the participating Centres.

Patients

Patients aged ≥18 years and affected by advanced/metastatic cancer, with an estimated prognosis of ≤6 months according to the attending oncologist's judgement, were eligible for the study, regardless of having received previous anticancer treatments for advanced disease. Patient recruitment was supervised directly by the heads of the oncology units and carried out by oncologists of each team. Per usual practice, after disease progression confirmation and careful clinical evaluation, the oncologist involved in the study took into account possible therapeutic options. The oncologist's decision on antitumoural therapy either had to concern itself with CT or targeted therapy. Patients were not eligible if the treatment was limited to hormonal therapy. The written informed consent was obtained from all patients enrolled in the study.

Study design

MIRTO is a multicenter prospective non-randomised study involving two sequential cohorts of ACP.

Cohort 1: standard care

In the first cohort, the study was observational: the usual practice of the oncologists to prescribe cancer therapy (hereinafter defined as chemotherapy (CT)) and to activate the local PC network were registered. On the basis of the oncologist's decision, patients were separated into two subgroups: those who received CT (CT/Yes) and those to whom CT was not prescribed (CT/No). While CT was delivered only at the oncology units, appropriate supportive treatments could be provided for at home or in hospice by activating the local PC services, as well as in the hospital. The activation of home care initiated with the oncologist's referral to the general practitioner (GP), who, according to the patient's and family's preferences, could choose either to manage it personally with the support of community healthcare services or to entrust it to the home care program of the ANT Foundation. Designed and initiated in Bologna, Italy in 1985,[18] the ANT program takes a hospital-at-home approach, with teams including doctors, nurses and psychologists all trained in PC, who visited patients at their homes based on an individual care plan with an additional 24 hours/7 days a week on-call service. At the patient's home, this program allows a wide spectrum of activities aimed at ensuring symptom control, psychoemotional and spiritual care and end-of-life care.[19] A number of complimentary services such as rehabilitation, nutritional support and social and family services are also made available. This advanced home care program, which overcomes the common GP-based or nurse-based home care services, is offered free of charge for patients and their families. In the territory of the oncology units involved in the study, the ANT Foundation is well known and has a high reputation. In virtue of this, many patients and families ask their GP to activate the ANT Foundation program when the oncologists suggest home PC service activation. According to patient clinical status and preferences, alternatively, the oncologist, the GP or the ANT physician could propose patient referral to hospice.

Cohort 2: closer integrated care

In the second cohort, the study became interventional: after having proposed the activation of a local PC network service according to the same procedure as described for cohort 1, before making therapeutic decisions, the oncologist had an initial in-hospital meeting with the local PC team that would have been assigned to care for the patient. If home care was to be planned, the consultation took place with the GP or with a base team of professionals of the ANT Foundation. If patient referral to a hospice has been considered an alternative option, a hospice doctor was expected to attend the meeting. If logistical problems hindered the organisation of such meetings, in some cases, the consultation was allowed to be done by phone. During the meeting, the oncologist discussed the therapeutic options that were available for optimal patient care. As for cohort 1, the decision taken at the meeting concerned whether or not to administer cancer therapy (CT/Yes or CT/No subgroups). The patient and family members were informed by the oncologist about the therapeutic option shared in the multiprofessional meeting, and their approval and acceptance were required.

Data collection and evaluation

Two sheets were filled out for each enrolled patient. The first one (enrolment sheet) was completed by the oncologist at the moment of therapeutic decision. Demographic information, a concise description of the medical case (primary tumour, sites of metastases, symptoms and Karnofsky Performance Status (KPS)), and a proposal to activate the local PC network were registered. This sheet was then filed electronically in a database that was specifically created for this study and is web accessible. The second sheet (outcome sheet) was filled out after the patient's death by a physician involved in the study. It retrospectively collected information regarding the last antitumour treatment received (treatment regimen and date of administration), PC service utilised, date and location of death and cause of death. This information was gathered from the archives of the institutions (hospital, ANT Foundation or hospice) that were involved in the patient care. The data of the outcome sheet were then released via web into the electronic database.

Statistics

Two major end points were represented by (1) the proportion of patients receiving the last CT in the last 30 days of life and (2) the proportion of patients who had effectively utilised a local PC service. The comparison of these two indicators was made between the two sequential patient cohorts. In addition, patient death location was considered a relevant end point to be monitored and compared. An 'intent-to-treat' analysis was performed on eligible patients who had died within 30 June 2015 and whose outcome sheet had been filled out.

The sample size estimation was based on the assumption that a 'closer integrated care' was able to reduce the risk for the patientreceiving CT in the last 30 days of life from 23% to 10%, using the results of the previous retrospective study conducted in the same geographical area as reference.[7] Assuming a 5% type I error (alpha two-tailed) and a study power of 80%, a total of 254 patients had to be enrolled.

The distribution of categorical patient characteristics and outcomes between the two cohorts were analysed using Pearson's χ^2 test and Fisher's exact test (when appropriate). A non-parametric Mann-Whitney U test was used to compare numerical data between the two cohorts. Overall survival of patients was analysed using the Kaplan-Meier method and compared between the two cohorts and between the two CT subgroups using the log-rank test. All tests w ere two sided, and the α-level of 5% was used to determine the statistical significance. Statistical analyses were carried out using the Statistical Package NCSS V.07.1.12.

RESULTS

The study was launched in October 2009, and cohort 1 was completed in March 2011, with a total enrolment of 122 patients. The enrolment of cohort 2 began in April 2011 and was completed in November 2012 with a total of 140 patients. In cohorts 1 and 2, respectively, 13 and 15 patients were not considered evaluable. The reasons were, respectively, 2 patients in cohort 1 and 1 patient in cohort 2 were not eligible, 11 and 9 patients were lost to follow-up (outcome sheet unavailability) and 5 patients in cohort 2 were still living as of 30 June 2015. A CONSORT (Consolidated Standards of Reporting Trials) diagram is reported in figure 1.

Table 1 shows the main demographic and clinical characteristics of 109 and 125 evaluable patients. The main difference between the cohorts was a significantly higher median KPS in cohort 2. In addition, cohort 2 comprised a lower percentage of men, gastrointestinal primary tumours and patients presenting with pain. The oncologist's decision to prescribe CT was taken in 51.4% and 60% of patients in cohorts 1 and 2, respectively (p=0.18).

The last chemotherapy

The use of CT near the end of life in patients in the CT/Yes subgroup is analysed in table 2. The percentage of patients who were found to have received the last CT in the last 30 days of life did not differ in the two cohorts. In the previous reference study, the percentage, that is, 22.7%, of patients receiving CT in the last 30 days was obtained by placing in the denominator the number of all patients who received at least one CT line for advanced disease. By adopting the same calculation modality, that is, adding to the patients in the CT/Yes subgroup those pretreated in the CT/No subgroup, we arrived at the following results: 20% (19/95) in cohort I and 19.5% (22/113) in cohort 2. Similarly, overlapping percentages are obtained, even if the calculation was made by placing all enrolled patients in the denominator, regardless of the decision taken at the study entry (19/109=17.4% in

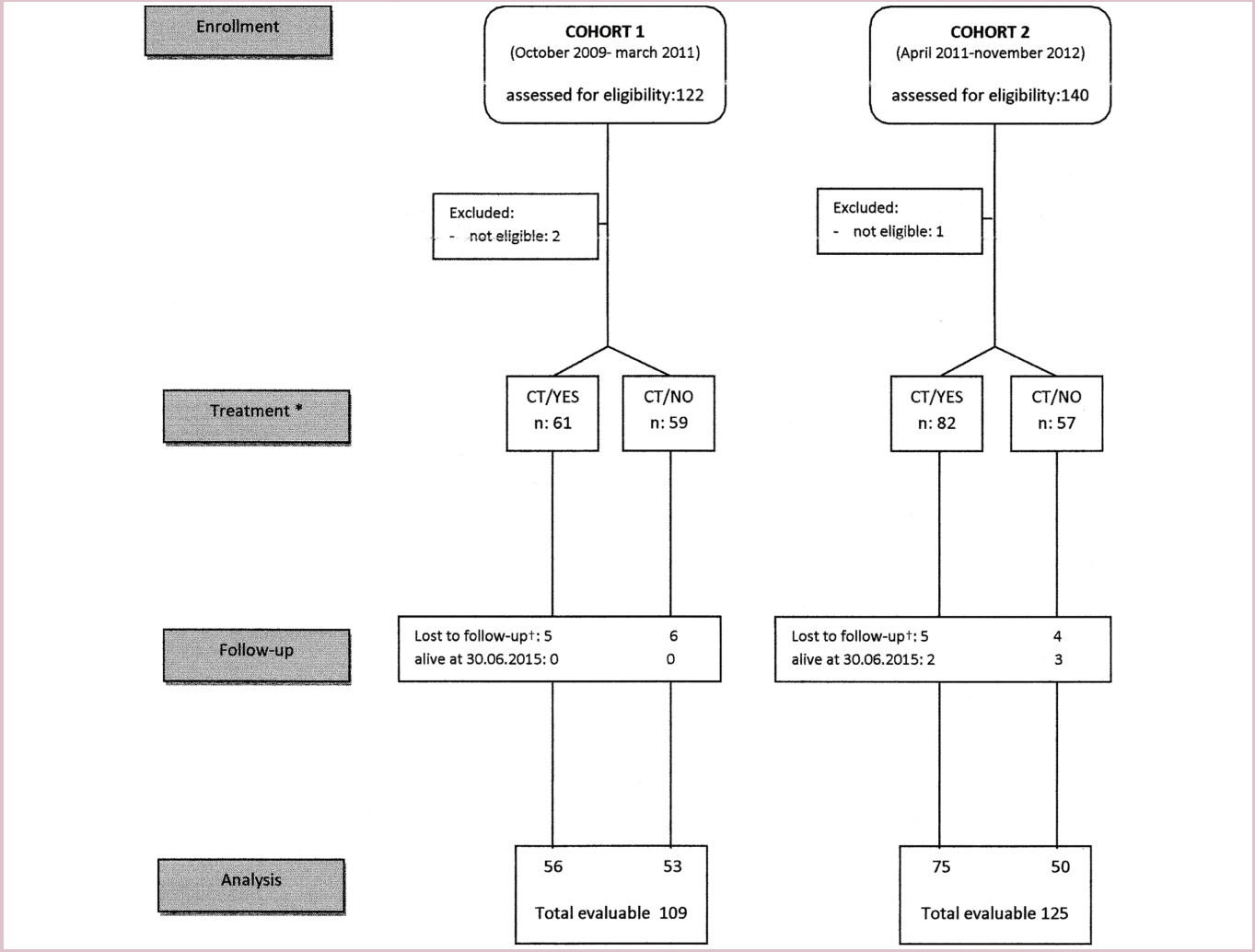


Figure 1 CONSORT diagram. *Treatment decision was made on clinical evaluation. †Outcome sheet is not evaluable. CONSORT, Consolidated Standards of Reporting Trials; CT, chemotherapy.

cohort 1 vs 22/125=17.6% in cohort 2). Lung and pleura and gastrointestinal were the most common primary tumour sites among patients who received CT in the last 30 days (51.2% and 19.5%, respectively), with no differences between the two cohorts.

Likewise, even the percentage of patients who had received the final CT within the last 60 days of life did not differ statistically, although a trend of a lower percentage in cohort 2 appeared. No difference was also shown for the use of CT in the last 14 days. The median time interval between the last CT administration and the date of death seems to be longer in cohort 2, yet the difference was not statistically significant.

There was no difference among CT regimens with regard to the administration route and number of drugs administered. On the contrary, more patients in cohort 2 had received more than three CT lines.

PC service utilisation

The PC service utilisation increased significantly in cohort 2 (figure 2) due to a substantial higher percentage of home PC service activation. The increase affected the CT/Yes (table 3) as well as CT/No (table 2) subgroups but was more marked in the former. One-third of the CT/Yes subgroup in cohort 1 did not activate any PC service despite being recommended by the oncologists. In cohort 2, non-activation despite the doctor's advice was reduced to less than 10%, where the increase in PC service utilisation was exclusively represented by the ANT home care program. On the other hand, a high percentage of patients (73.6%) in the CT/No subgroup had activated PC services, reaching more than 90% in cohort 2. Unlike what was observed in the CT/Yes subgroup, all PC services contributed to an increase in utilisation in the CT/No subgroup.

Location of death and survival

Disease progression was generally reported as the cause of death (86%), but in 12.8%, the cause was unknown. Death due to vascular complications was reported in two cases, and death attributed to treatment toxicity was reported only in one patient in cohort 2. The most frequent place in which patients died was at home (figure 3). The percentage of patients who died at home

Table 1 Main patient characteristics at study entry

	Cohort 1	Cohort 2	p Value
Evaluable patients	109	125	
Men/women	66/43	57/68	* 0.03
Age median (range)	69 (25–87)	70 (38–87)	† 0.63
KPS median (range)	70 (<50–100)	80 (<50–100)	† 0.00
Primary tumour site			*
GI	43 (39.4%)	24 (19.2%)	0.04
Lung and pleura	37 (33.9%)	58 (46.4%)	0.07
Gyn	9 (8.3%)	14 (11.2%)	–
GU	8 (7.3%)	12.2 (9.6%)	–
Breast	4 (3.7%)	5 (4%)	–
Others	8 (7.3%)	12 (9.6%)	–
Comorbidity (CIRS-G)[36]			*
Patients with comorbidity	81 (74.3%)	84 (67.2%)	0.23
Symptoms			*
Anorexia	48 (44%)	58 (46.8%)	0.67
Asthenia	79 (72.5%)	98 (79.0%)	0.24
Pain	65 (59.6%)	47 (37.9%)	0.00
Dispnoea	28 (25.7%)	28 (22.6%)	0.58
Other	14 (12.8%)	30 (24.0%)	0.03
Decision on CT prescription			
No	53 (48.6%)	50 (40%)	*
Yes	56 (51.4%)	75 (60%)	0.18

*Pearson's χ^2 test.
†Mann-Whitney U test.
CIRS-G, Cumulative Illness Rating Scale for Geriatrics; CT, chemotherapy; GI, gastrointestinal; GU, genitourinary; Gyn, gynecologic; KPS, Karnofsky Performance Status.

increased significantly in cohort 2 (from 40.4% to 56.8%, p=0.01), as well as those who died in an in-patient hospice setting (from 8.3% to 19.2%, p=0.00). The total result was a significant reduction of in-hospital deaths. These changes similarly concern the CT/Yes (table 3) and the CT/No subgroup (table 2), being more marked in the former subgroup.

The overall median survival was 56 days (95% CI 49 to 74) in cohort 1 and 87 days (95% CI 73 to 120) in cohort 2 (p=0.001). The survival difference between the two cohorts affects only patients in the CT/Yes subgroup (table 3) and not those in the CT/No subgroup (table 2). There is no survival difference in patients with or without the ANT home care support.

DISCUSSION

The MIRTO study was conducted at the Oncology departments of the Bologna and Ferrara University hospitals, both ESMO (European Society of Medical Oncology) Designated Centres of Integrated Oncology and PC, since 2008 and 2010, respectively.[20] The study was aimed to improve their integration care model by introducing a preliminary in-hospital consultation between oncologists and professionals of the respective local PC network. Two sequential cohorts of patients were prospectively enrolled: the first was treated accordingly to the usual practice, while in the second one, a new intervention was introduced. With the introduction of an initial in-hospital meeting with oncologists and local PC service professionals, we expected to create conditions in order to enhance collaboration regarding treatment options. This would facilitate a final transition of patient care from the hospital to a territorial hospice or at the patient's home. Consequently, this new model of integration may have reduced the use of CT in the last weeks of life. The two cohorts showed some differences in their baseline composition, the most relevant being represented by a significantly higher median KPS (80 vs 70) in cohort 2. It is very likely that the introduction of an initial meeting between professionals may have led to a spontaneous anticipation of PC service activation in cohort 2, although an earlier PC activation was not an explicit objective of the study. Thus, MIRTO indirectly favoured an earlier PC implementation, whose benefits are already supported by at least four randomised clinical trials[21–24] and are now recommended by main oncology guidelines.[25 26] The pre-existing attitude of the oncologists participating in the MIRTO study towards an integrated clinical approach is evidenced by the high rate of local PC service use already in cohort 1 (60.6%). Nevertheless,

Table 2 Outcomes in patients in which the decision was to treat (CT/Yes)

	Cohort 1 56	Cohort 2 75	p
Days between the last dose and death			*
Median (range)	44 (2 to 510)	56 (2 to 516)	0.21
95% CI	32 to 58	37 to 77	
Mean±SD	73±96.2	88±95.0	
Chemotherapy use			†
Any within 60 days of death	35 (62.5%)	36 (48%)	0.23
Any within 30 days of death	19 (33.9%)	22 (29.3%)	0.83
Any within 14 days of death	8 (14.3%)	14 (18.7%)	0.51
Last chemotherapy regimen			†
Intravenous	43 (76.8%)	58 (77.3%)	0.94
Multidrug regimen	14 (25%)	24 (32%)	0.38
One-drug regimen	29 (50%)	34 (44%)	0.46
Oral‡	11 (19.6%)	16 (21.3%)	0.81
Missing	1 (1.8%)	–	
CT lines received			†
1	30 (54.5%)	31 (41.9%)	0.16
2–3	21 (38.2%)	26 (35.1%)	0.74
>3	4 (7.2%)	17 (23.%)	0.02
			Overall distribution comparison: 0.05
			†
PC services utilisation	27 (48.2%)	63 (84%)	0.00
Home care – ANT	20 (35.7%)	54 (72%)	0.00
Home care – GP	6 (10.7%)	8 (10.7%)	0.99 $
In-patient hospice	1 (1.8%)	1 (1.3%)	0.00
PC proposed but not activated	19 (33.9%)	7 (9.3%)	
No activation	9 (16.1%)	5 (6.7%)	
Missing	1 (1.8%)	–	
Location of death			†
Home	22 (39.3%)	44 (57.3%)	0.03
Hospital	20 (35.7%)	15 (20%)	0.04
In-patient hospice	2 (3.6%)	12 (16%)	0.02
Other	2 (3.6%)	– (–)	Overall distribution comparison:
Missing	10 (17.8%)	4 (5.3%)	0.00
Overall survival (days)			¶
Median (range)	73 (8 to 547)	158 (7 to 700)	0.00
95% CI	56 to 102	115 to 189	

*Mann-Whitney test.
†Pearson's χ^2 test.
‡Including TKI.
$Fisher's exact test.
¶Log-rank test.
ANT, Assistenza Nazionale Tumori Foundation; GP, general practitioner; PC, palliative care; TKI, tyrosine kinase inhibitor.

the introduction of the intervention has been able to produce an additional significant increase in cohort 2. The increase was particularly marked in patients in the CT/Yes subgroup, where the doubling of cases activating the ANT Foundation home PC program occurred.

Despite achieving an increase in local PC service utilisation, the MIRTO study failed to reach its other main objective, that is, reducing the use of CT near the end of life. The percentage of patients who received CT in the last 30 days and in the last 14 days of life was not altered, even though a closer collaboration between oncologists and local PC teams was established. Two of the four abovementioned phase III trials that compared early PC with standard care evaluated the impact of early PC on CT administration near the end of life and found no effect on CT in the last 14 days[24 25] or in the last 30 days.[27] However, Greer *et al*[27] in their study involving patients with advanced non-small-cell lung cancer had observed that patients assigned to early PC had almost half the rate of intravenous CT administration in the final 60 days of life and significantly longer time period elapsing between their last infusion dose and death. We have also evaluated these two parameters: While the lack of statistically significant differences between the two cohorts

Table 3 Outcomes in patients in which the decision was not to treat (CT/No)

	Cohort 1 53	Cohort 2 50	p
			*
PC service	39 (73.6%)	46 (92.%)	0.01
Home care – ANT	31 (58.5%)	31 (62%)	0.71
Home care – GP	5 (9.4%)	10 (20%)	0.12
In-patient hospice	3 (5.7%)	5 (10%)	0.47 †
PC proposed but not activated	6 (11.3%)	2 (4%)	0.27 †
No activation	8 (15.1%)	1 (2%)	
Missing	–	–	
Location of death			*
Home	22 (41.6%)	28 (56%)	0.14
Hospital	16 (30.2%)	5 (10%)	0.01
In-patient hospice	7 (13.2%)	12 (24%)	0.16
Other	1 (1.8%)	1 (2%)	
Missing	7 (13.2%)	4 (8%)	
			(overall distribution comparison: 0.01)
Overall survival			‡
Median (range)	41 (5 to 337)	49 (2 to 373)	0.76
95% CI	30 to 55	39 to 59	

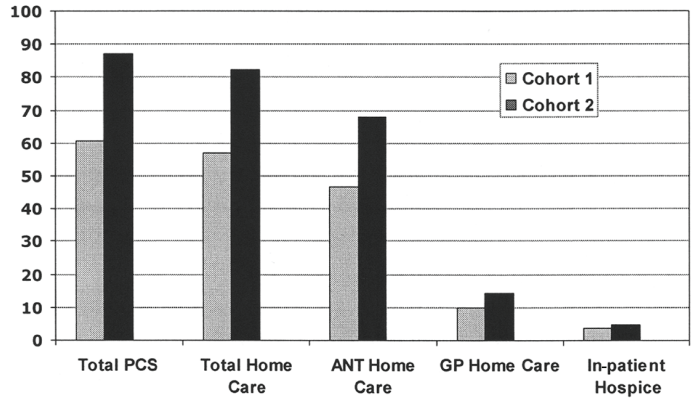
*Pearson's χ^2 test.
†Fisher's exact test.
‡Log-rank.
ANT, Assistenza Nazionale Tumori Foundation; GP, general practitioner; PC, palliative care.

was confirmed, a trend towards a lower percentage of patients who received CT in the last 60 days of life (48% vs 62.5%) and towards a longer median time between their last CT dose and death (56 vs 44 days) were observed in cohort 2. Thus, our results, together with those found in the literature, seem to indicate that the reduction of CT use in the last weeks of life is a very difficult goal to achieve, regardless of the adopted integration model. Many reasons are probably involved in the lack of effect on the use of CT in the last 30 days depending on the oncologists themselves,[28–30] the patients[31 32] and the type of cancer.[33] Conversely, CT administered during the last 60 days and the time interval between the last CT and death would seem to be more sensitive indicators measuring the effect of interventions aimed at reducing the pharmacological aggressiveness near the end of life. Studies appropriately designed to validate these indicators would be needed.

As a result of the intervention introduced by the MIRTO study, there has been a significant increase of home and hospice deaths with a corresponding halving of those in the hospital. Although the place of death was not a main objective of the study, this result appears to be a major achievement that supports the preferences of ACP in many European countries.[34] While confirming the direct relationship between home care and the increasing chances of dying at home,[35] the MIRTO study also emphasises the importance of the availability of a qualified and comprehensive home care program such as that provided by the ANT Foundation.

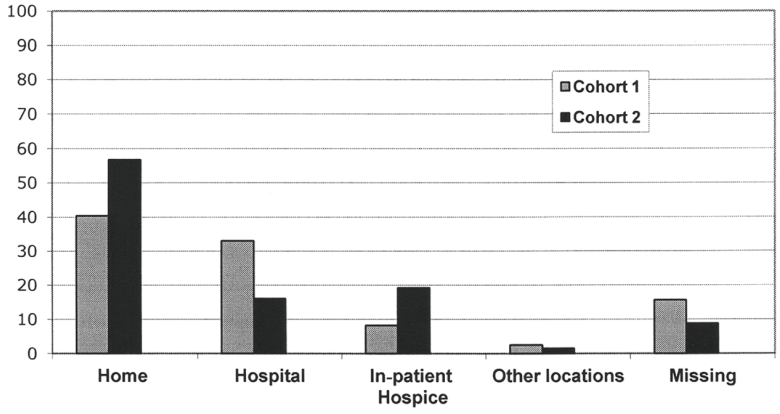
Several limitations of the study would deserve mention: The main one is represented by the study's non-randomised design. This has brought about differences between the two cohorts that affect their comparison, suggesting that extreme caution should be taken in interpretating certain results, such as the survival difference between the two cohorts. An additional limitation that may be considered is the non-use of validated tools for judging a prognosis of less than 6 months by the recruiting oncologist. However, the results seem to show a good ability of the participating physicians to estimate prognosis, as the patient median survival in the two cohorts is contained within 6 months. A further limitation is the lack of PC intensity measurement during the study. The availability of these data would have been able to better interpret the results observed. However, the increase in ANT home care utilisation in cohort 2 leads us to extrapolate that this service is preferred by oncologists, patients and families for its more comprehensive and, probably, more intense intervention. Another important limitation is the lack of a large-scale applicability of the MIRTO model. In fact, it is based on the local health organisation and the availability of specific resources such as those provided by the ANT Foundation advanced home PC program. Since ANT teams are concomitantly present in eight other Italian regions, it is desirable that the indications of this study are taken into account by the authorities responsible for healthcare in those areas.

In conclusion, the MIRTO study has shown that an initial meeting involving oncologists and professionals of the local PC network, with the aim of improving the integration of



	Total PCS	Total Home Care	ANT Home Care	GP Home Care	In-patient Hospice
Cohort 1 (109)	66 (60.6%)	62 (56.9%)	51 (46.85)	11 (10.1%)	4 (3.7%)
Cohort 2 (125)	109 (87.2%)	103(82.4%)	85 (68%)	18 (14.4%)	6 (4.8%)
p	0.00000	0.0000	0.0010	0.3184	0.7545

Figure 2 PCS utilisation. statistical tests: Pearson's χ^2 and fisher's exact test. ANT, Assistenza Nazionale Tumori Foundation; GP, general practitioner; PC, palliative care.



	Home	Hospital	In-patient Hospice	Other Locations	Missing
Cohort 1 (109)	44 (40.4%)	36 (33%)	9 (8.3%)	3	17(15.6%)
Cohort 2 (125)	71(56.8%)	20 (16%)	24 (19.2%)	2	8(6.5%)
p	0.0121	0.0023	0.0085	-	0.0258

Figure 3 Location of death. Statistical tests: Pearson's χ^2 test.

oncology and PC, was not able to reduce the utilisation of CT near the end of ACP life. However, this newly integrated model was associated with an increased use of local PC services and a significant increase in home and hospice deaths. We believe that in order to promote an appropriate and wise use of anticancer treatments in ACP with a short life expectancy and in addition to the implementation of oncology and PC integration models according to the local health systems, a strong commitment has to be made by competent institutions (universities, scientific societies, etc) in educating oncologists to have a more comprehensive view of patients with cancer.

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