Chapitre 11 : Considérations spécifiques.

Septième question de la conférence de consensus

Quelles sont les spécificités à prendre en compte en réanimation ?

1. Barrières et protection contre les infections

A. Prophylaxie antibiotique contre les infections bactériennes

Des études sur la prophylaxie antibiotique chez des patients neutropéniques atteints de tumeurs malignes solides et hématologiques ont rapporté un bénéfice limité et inconsistant sur la mortalité. L'utilisation de l'antibioprophylaxie est associée à une **incidence accrue de résistance bactérienne** aux molécules utilisées mais aussi de bactéries multirésistantes. Aucune étude n'a spécifiquement évalué l'antibioprophylaxie en USI chez les patients cancéreux.

Anaesth Crit Care Pain Med 38 (2019) 549–562

SFAR
Société Française d'Anesthésie et de Réanimation

Guidelines

Antibioprophylaxis in surgery and interventional medicine (adult patients). Update 2017☆,☆☆

C. Martin[i], C. Auboyer[a], M. Boisson[b], H. Dupont[c], R. Gauzit[d], M. Kitzis[e], M. Leone[f,*], A. Lepape[g], O. Mimoz[b], P. Montravers[h], J.L. Pourriat[d], Steering committee of the French Society of Anaesthesia and Intensive Care Medicine (SFAR) responsible for the establishment of the guidelines

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[i] *Anaesthesia and intensive Care, North university hospital, 13015 Marseille, France*

Recommandations

La prophylaxie antibiotique ne devrait probablement pas être administrée aux patients cancéreux en soins intensifs, en dehors du cadre périopératoire. (Avis d'expert, faible recommandation)

B. Contrôle environnemental

- L'isolement protecteur s'est avéré efficace pour limiter les complications infectieuses et même la mortalité chez les patients neutropéniques. L'isolement protecteur semble être le plus efficace chez les patients présentant une **neutropénie profonde** (< 500/mm³) et/ou **prolongée** (> 7 jours). Cependant, il existe une grande variation dans les modalités d'isolement protecteur d'une étude à l'autre et toutes les modalités ne réduisent pas le risque de contamination aéroportée par les spores d'**Aspergillus**.
- L'isolement protecteur doit comprendre **l'isolement géographique** (chambre individuelle), **l'isolement technique** (soignants et visiteurs vêtus de gants, blouse chirurgicale, bonnet et masque) et **la désinfection des surfaces**. La **filtration de l'air** (filtre HEPA et flux laminaire) et un sas sont des mesures recommandées, notamment dans le cadre d'un déficit immunitaire profond. Cependant, ces mesures ne doivent pas entraver la qualité des soins aux patients atteints de cancer en phase critique et doivent être adaptées aux possibilités architecturales de l'unité. Il convient de noter qu'en l'absence d'un élément de ces mesures, le bénéfice de l'isolement n'est plus observé.
- Il est à noter que cette recommandation est basée sur des études publiées il y a plus de 30 ans. La reproductibilité de ces études dans la pratique actuelle est incertaine.

MAJOR ARTICLE

The Influence of High-Efficiency Particulate Air Filtration on Mortality and Fungal Infection among Highly Immunosuppressed Patients: A Systematic Review

Tim Eckmanns,[1] Henning Rüden,[1] and Petra Gastmeier[2]

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The Journal of Infectious Diseases 2006; 193:1408–18

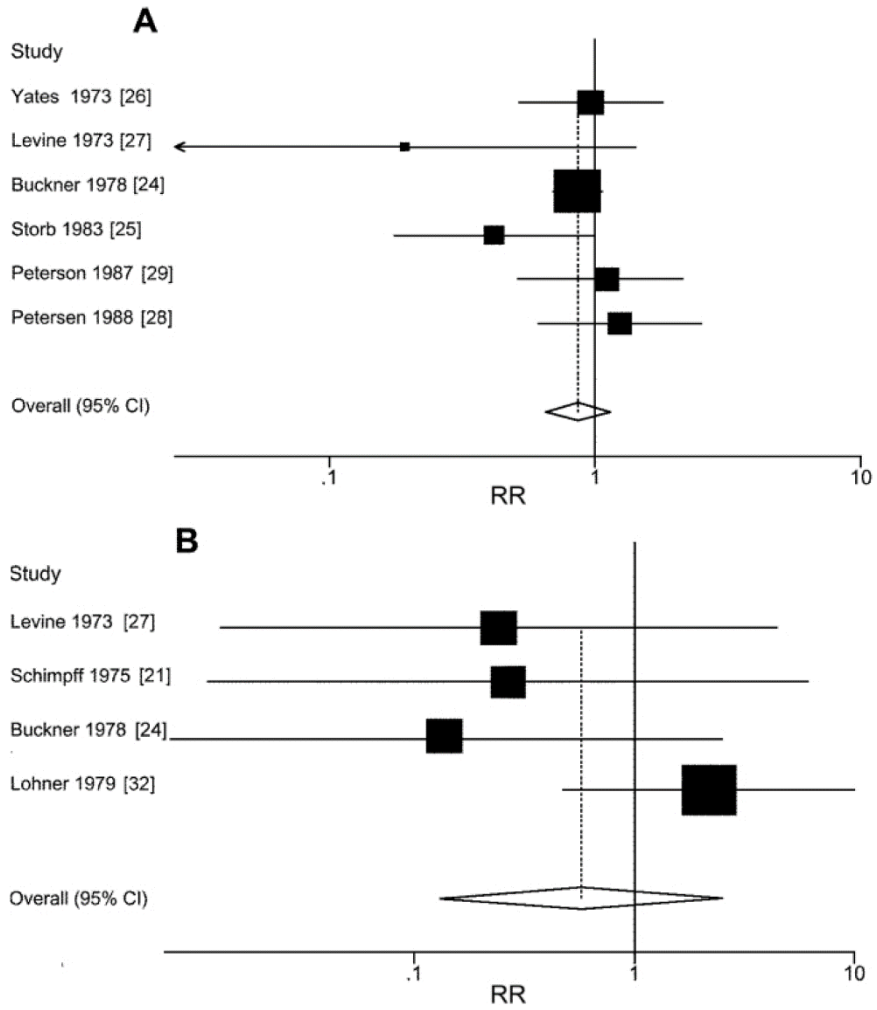

Figure 2. Forrest plot of relative risks (RRs) and 95% confidence intervals (CIs) for mortality *(A)* in 6 randomized controlled trials (RCTs) of air filtration and for fungal infection *(B)* in 4 RCTs of air filtration.

Recommandations

L'isolement protecteur devrait probablement être requis en cas de neutropénie profonde (< 500/mm³) et/ou prolongée (> 7 jours) chez les patients cancéreux en phase critique. Cependant, les avantages de l'isolement protecteur doivent être compensés par le risque d'événements indésirables, plus particulièrement dans un contexte d'urgence (Grade C, forte recommandation)

2. Choix de l'abord vasculaire et prévention des infections

A. Choix de l'abord vasculaire

Il n'existe pas de littérature spécifiquement consacrée aux patients atteints de cancer. Par conséquent, les recommandations générales pour les patients gravement malades doivent être appliquées.

Cependant, en raison d'un risque plus élevé de complications (hémorragiques et infectieuses), une stratégie privilégiant l'utilisation primaire d'une voie veineuse périphérique doit être évaluée chez les patients cancéreux en état critique avant de la recommander.

Guidelines for the prevention of intravascular catheter-related infections

Naomi P. O'Grady,[a] Mary Alexander,[b] Lillian A. Burns,[c] E. Patchen Dellinger,[d] Jeffrey Garland,[e] Stephen O. Heard,[f] Pamela A. Lipsett,[g] Henry Masur,[a] Leonard A. Mermel,[h] Michele L. Pearson,[i] Issam I. Raad,[j] Adrienne G. Randolph,[k] Mark E. Rupp,[l] Sanjay Saint,[m] and the Healthcare Infection Control Practices Advisory Committee (HICPAC) (Appendix 1)

Bethesda, Maryland; Norwood, Worcester, Boston, Massachusetts; Staten Island, New York, Seattle, Washington; Milwaukee, Wisconsin; Baltimore, Maryland; Rhode Island; Atlanta, Georgia; Houston, Texas, Omaha, Nebraska; and Ann Arbor, Michigan

 (Am J Infect Control 2011;39:S1-34.)

Central or Peripheral Catheters for Initial Venous Access of ICU Patients: A Randomized Controlled Trial

Jean-Damien Ricard, MD, PhD[1,2]; Laurence Salomon, MD, PhD[3]; Alexandre Boyer, MD[4]; Guillaume Thiery, MD[5]; Agnes Meybeck, MD[1]; Carine Roy, MSc[6]; Blandine Pasquet, MSc[6]; Eric Le Mière, MD[1]; Didier Dreyfuss, MD[1,2]

Objectives: The vast majority of ICU patients require some form of venous access. There are no evidenced-based guidelines concerning the use of either central or peripheral venous catheters, despite very different complications. It remains unknown which to insert in ICU patients. We investigated the rate of catheter-related insertion or maintenance complications in two strategies: one favoring the central venous catheters and the other peripheral venous catheters.

Design: Multicenter, controlled, parallel-group, open-label randomized trial.

Setting: Three French ICUs.

Patients: Adult ICU patients with equal central or peripheral venous access requirement.

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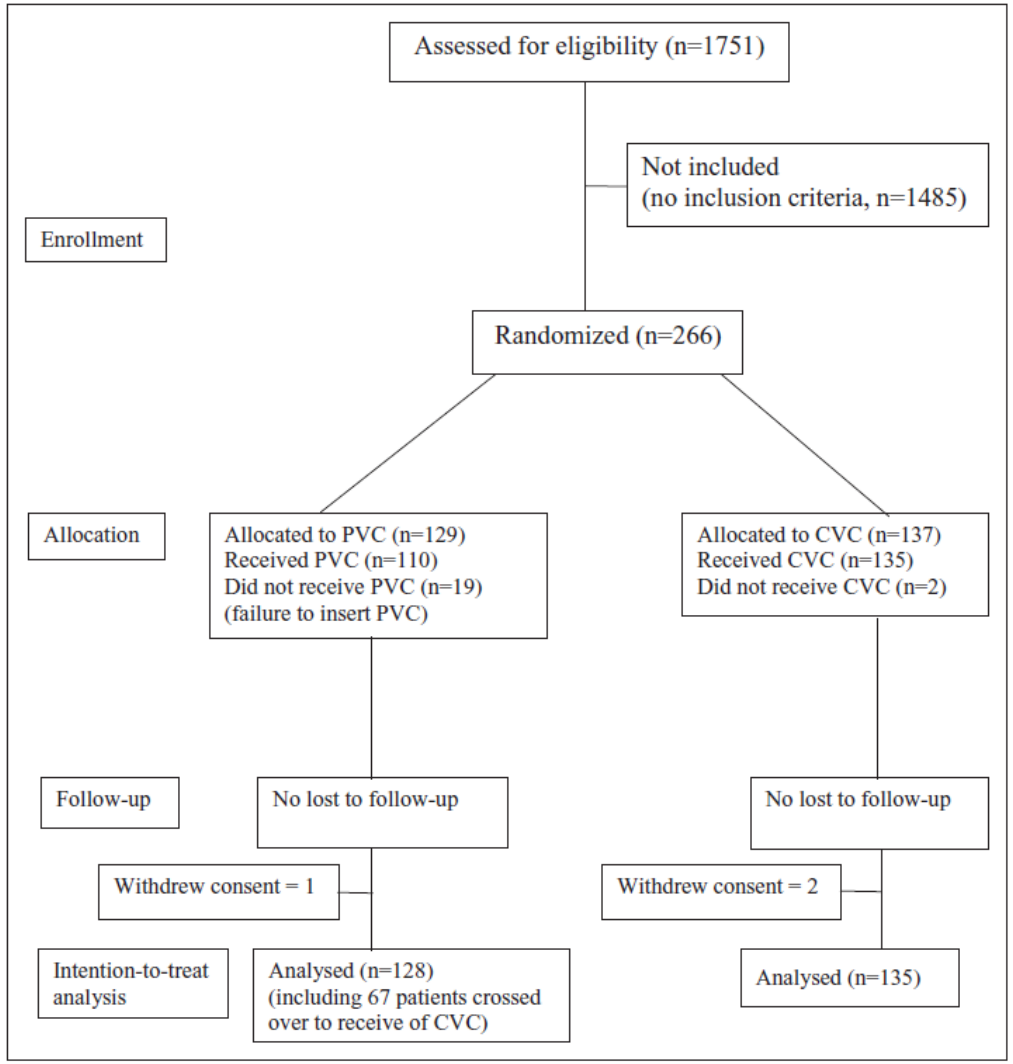

Figure 1. Patient flowchart indicating numbers of patients screened for eligibility, enrolled, allocated to each group, lost to follow-up, and finally analyzed in the study. PVC = peripheral venous catheter, CVC = central venous catheter.

TABLE 3. List and Number of Occurrences of Major Complications in Each Allocation Group

	Central[a]	Peripheral[a]	*p*
Patients without any complication, no.	86	67	0.06
At least one complication, no. patients			
Mechanical	42	51	0.14
Infectious	18	23	0.30
Thrombotic	1	5	0.09
Major complications, no. of complications	87	133	0.02
Mechanical	63	92	0.06
Pneumothorax	3	3	
Arterial puncture	7	4	
Hematoma	1	1	
Central venous catheter insertion site changes	34	9	
Peripheral venous catheter insertion difficulties	16	56	
Subcutaneous diffusion	2	19	
Infectious	23	36	0.25
Erythema (>2 cm from insertion site)	8	20	
Phlebitis	1	1	
Unexplained bacteremia	9	6	
Catheter-related bacteremia	1	0	
Catheter infection	4	9	
Thrombotic	1	5	0.09

[a]Initial group assignment (central or peripheral venous catheter).

TABLE 4. List and Number of Occurrences of Minor Complications in Each Allocation Group

	Central[a]	Peripheral[a]	*p*
Patients without any complication, no.	52	42	0.33
At least one complication, no. patients			
Mechanical	54	58	0.38
Infectious	49	68	0.006
Thrombotic	2	5	0.27
Minor complications, no. of complications	201	248	0.06
Mechanical	111	120	0.35
Infectious	88	123	0.009
Thrombotic	2	5	0.23

[a]Initial group assignment (central or peripheral venous catheter).

TABLE 5. Complications According to the Common Terminology Classification for Adverse Events Classification

	Peripheral[a]	Central[a]	*p*
All grades	1.54 (198/128)	0.89 (120/135)	0.0001
Grades 1 and 2	1.41 (180/128)	0.83 (112/135)	0.0001
Grades 3 and 4	0.13 (18/128)	0.06 (8/135)	0.13

[a]Initial group assignment (central or peripheral venous catheter).

Taken together, our results provide for the first time data on which to a base a decision regarding venous access in ICU patients. In patients whom could be managed either with a PVC or a CVC, a strategy based on systematic insertion of CVCs is associated with fewer complications.

Recommandations

L'utilisation de cathéters centraux à plusieurs lumières est préférable en USI (Grade C, forte recommandation)

B. Gestion de l'approche vasculaire

Toute approche vasculaire augmente le risque d'infection et de thrombose. Plusieurs approches ont été étudiées : cathéter veineux central (CVC) (jugulaire, sous-clavier ou fémoral), cathéter central à insertion périphérique (PICC) ou cathéter à port implanté ; cependant, aucune étude n'a comparé ces trois modalités ensemble. La ligne veineuse périphérique initiale suivie d'un CVC a eu plus de complications par rapport au CVC de première ligne. La durée de vie moyenne du cathéter est de 10 jours (critère d'évaluation : infection). **Les cathéters à port implanté ont le taux d'infection le plus bas**, tandis que les CVC ont le plus haut et les PICC ont un risque intermédiaire.

BJA

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doi: 10.1016/j.bja.2019.01.038
Advance Access Publication Date: 17 April 2019
Clinical Practice

Clinical impact of peripherally inserted central catheters *vs* implanted port catheters in patients with cancer: an open-label, randomised, two-centre trial

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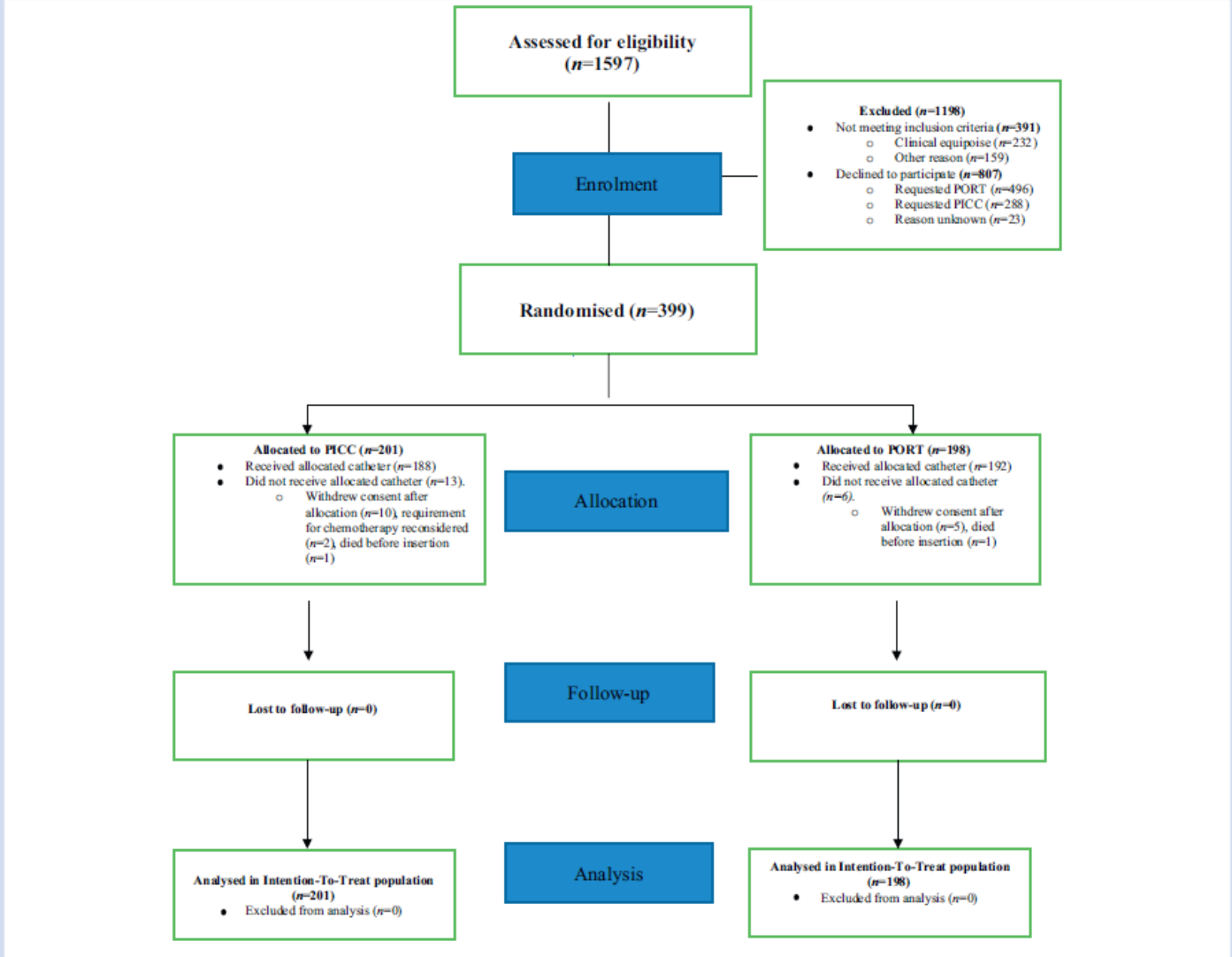


Fig 1. Study outline. PICC, peripherally inserted central catheter; PORT, totally implanted access port.

Table 1 Baseline characteristics of the intention-to-treat population. Data are presented as *n* (%) or median (range). PICC, peripherally inserted central catheter; PORT, totally implanted venous access port; 5-FU, 5-fluorouracil. *Data were collected retrospectively

	PICC (*n*=201)	PORT (*n*=198)
Including centre		
Ryhov	170 (84.6)	172 (86.9)
Växjö	31 (15.4)	26 (13.1)
Sex		
Female	110 (54.7)	115 (58.1)
Male	91 (45.3)	83 (41.9)
Age (yr)	66 (19–84)	65 (30–89)
Cancer		
Breast	78 (38.8)	80 (40.4)
Colorectal	45 (22.3)	41 (20.7)
Upper gastrointestinal tract	26 (12.9)	25 (12.6)
Urogenital	28 (13.9)	32 (16.1)
Other	24 (11.9)	20 (10.1)
Treatment goal		
Adjuvant	135 (67.2)	130 (65.7)
Palliative	66 (32.8)	68 (34.3)
Treatment includes*		
Continuous 5-FU infusion	32 (15.9)	32 (16.2)
Bevacizumab	5 (2.5)	4 (2.0)

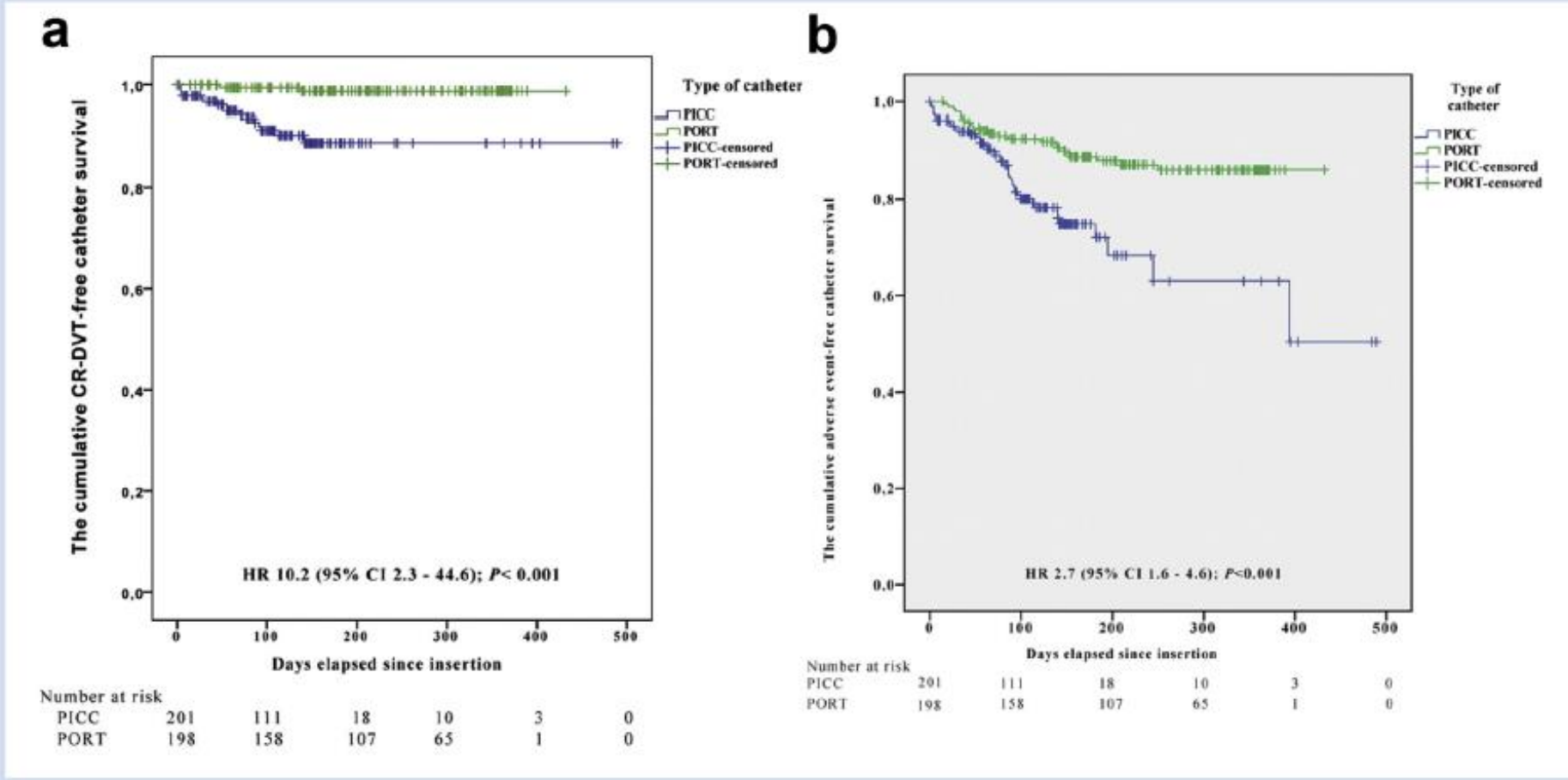


Fig 2. (a) The cumulative CR-DVT-free catheter survival rates of the two systems; P-value by the log rank test. (b) The cumulative adverse event-free catheter survival rates (thrombosis, infection, occlusive and mechanical) of the two catheter systems; P-value by the log rank test. Analysis of the intention-to-treat population. CI, confidence interval; CR, catheter-related; PICC, peripherally inserted central catheter; PORT, totally implanted access port.

C. Gestion du cathéter

- Deux méthodes sont décrites : les cathéters imprégnés d'antiseptiques et l'utilisation d'éponges antiseptiques ; leur application stricte est faisable et est associée à une réduction des infections liées aux cathéters.
- L'utilisation de cathéters imprégnés n'est pas associée à une réduction des complications infectieuses ou de la mortalité. Toutes les données ont été extraites d'études réalisées dans la population générale des soins intensifs qui, cependant, incluaient des patients cancéreux gravement malades.
- En l'absence de données précises, les recommandations générales pour les patients gravement malades doivent être appliquées.

Cochrane Library

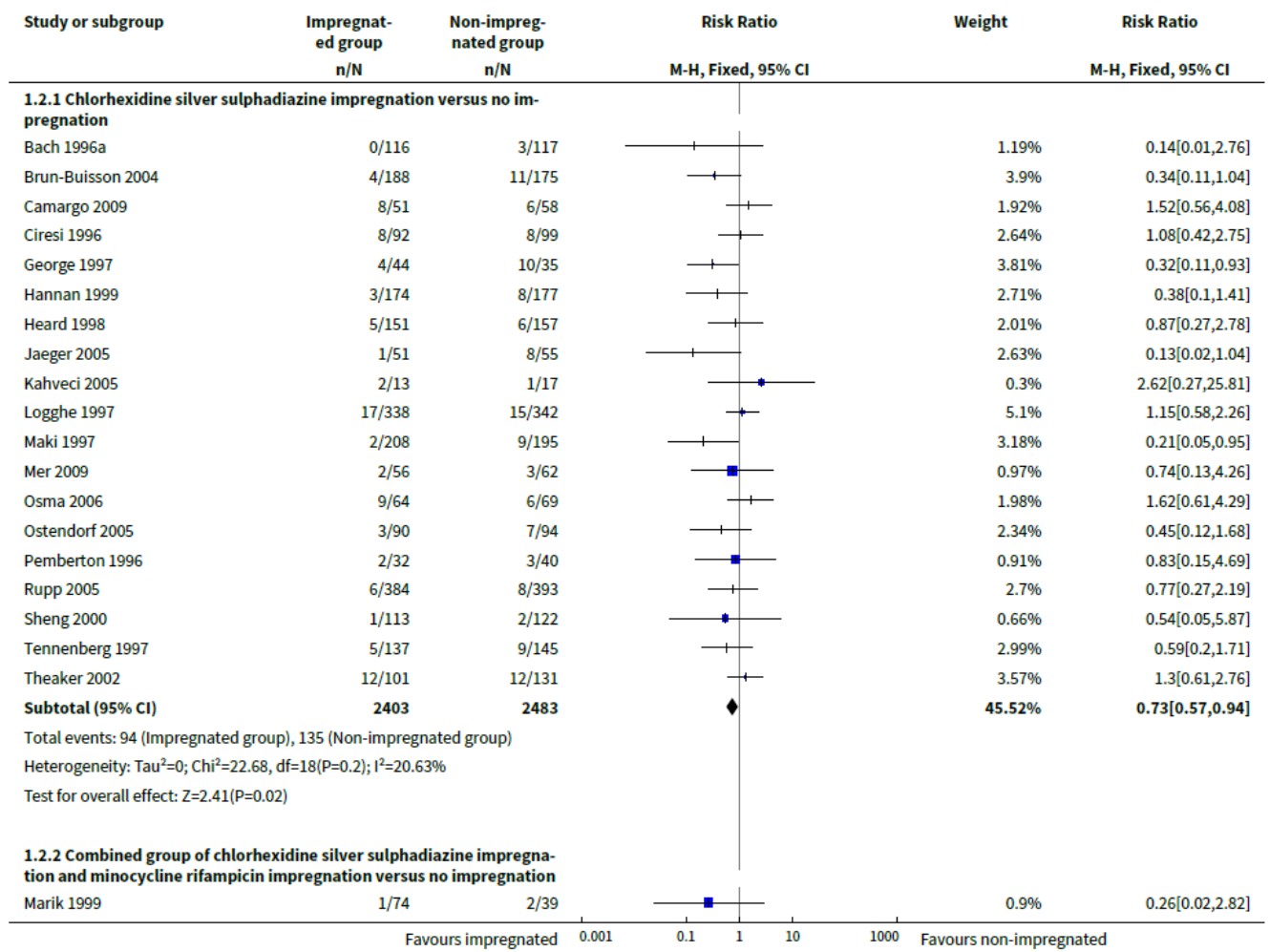
Cochrane Database of Systematic Reviews

Catheter impregnation, coating or bonding for reducing central venous catheter-related infections in adults (Review)

Lai NM, Chaiyakunapruk N, Lai NA, O'Riordan E, Pau WSC, Saint S

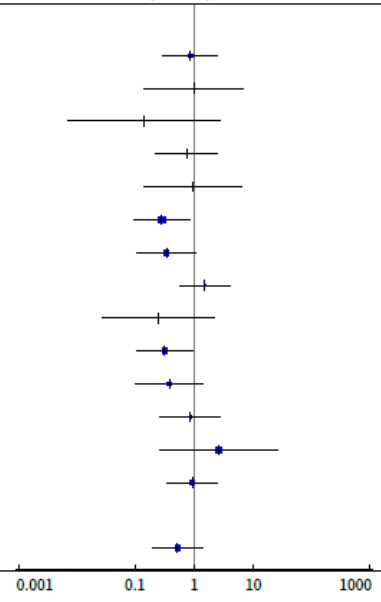
Lai NM, Chaiyakunapruk N, Lai NA, O'Riordan E, Pau WSC, Saint S.
Catheter impregnation, coating or bonding for reducing central venous catheter-related infections in adults.
Cochrane Database of Systematic Reviews 2016, Issue 3. Art. No.: CD007878.
DOI: 10.1002/14651858.CD007878.pub3.

Analysis 1.2. Comparison 1 Impregnated catheters versus non-impregnated catheters, Outcome 2 Catheter-related bloodstream infection (CRBSI).



Analysis 3.1. Comparison 3 Impregnated catheters versus non-impregnated catheters: subgroup analysis based on participant type, Outcome 1 Catheter-related bloodstream infection (CRBSI).

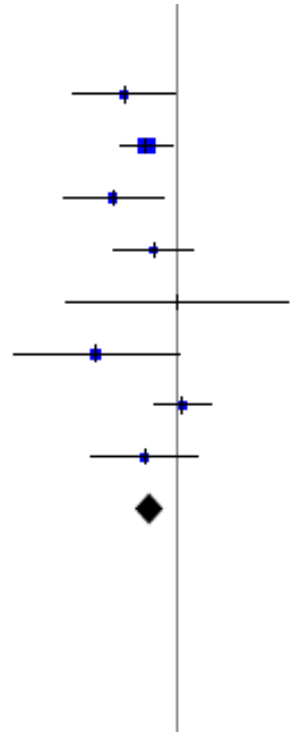
Study or subgroup	Impregnated group n/N	Non-impregnated group n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.1.1 Patients in intensive care units					
Antonelli 2012	6/135	7/137		4.89%	0.87[0.3,2.52]
Arvaniti 2012	2/159	2/156		1.42%	0.98[0.14,6.88]
Bach 1996a	0/116	3/117		2.45%	0.14[0.01,2.76]
Bach 1996b	3/10	4/10		2.81%	0.75[0.22,2.52]
Bach 1999	2/34	2/33		1.43%	0.97[0.15,6.49]
Boswald 1999	4/86	13/79		9.53%	0.28[0.1,0.83]
Brun-Buisson 2004	4/188	11/175		8.01%	0.34[0.11,1.04]
Camargo 2009	8/51	6/58		3.95%	1.52[0.56,4.08]
Corral 2003	1/103	4/103		2.81%	0.25[0.03,2.2]
George 1997	4/44	10/35		7.84%	0.32[0.11,0.93]
Hannan 1999	3/174	8/177		5.58%	0.38[0.1,1.41]
Heard 1998	5/151	6/157		4.14%	0.87[0.27,2.78]
Kahveci 2005	2/13	1/17		0.61%	2.62[0.27,25.81]
Kalfon 2007	8/320	8/297		5.84%	0.93[0.35,2.44]
Kamal 1991	0/60	0/33			Not estimable
Leon 2004	6/187	11/180		7.89%	0.53[0.2,1.39]



Study or subgroup	Impregnated group n/N	Non-impregnated group n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Maki 1997	2/208	9/195		6.54%	0.21[0.05,0.95]
Marik 1999	1/74	2/39		1.84%	0.26[0.02,2.82]
Mer 2009	2/56	3/62		2%	0.74[0.13,4.26]
Osma 2006	9/64	6/69		4.06%	1.62[0.61,4.29]
Rupp 2005	6/384	8/393		5.56%	0.77[0.27,2.19]
Sheng 2000	1/113	2/122		1.35%	0.54[0.05,5.87]
Sherertz 1996	7/126	3/128		2.09%	2.37[0.63,8.96]
Theaker 2002	12/101	12/131		7.35%	1.3[0.61,2.76]
Subtotal (95% CI)	**2957**	**2903**		**100%**	**0.7[0.55,0.9]**
Total events: 98 (Impregnated group), 141 (Non-impregnated group)					
Heterogeneity: Tau^2=0; Chi^2=25.76, df=22(P=0.26); I^2=14.58%					
Test for overall effect: Z=2.81(P=0)					

3.1.2 Patients in haematological or oncological units

Abdelkefi 2007	3/120	11/120	12.12%	0.27[0.08,0.95]
Goldschmidt 1995	12/120	24/113	27.23%	0.47[0.25,0.9]
Hanna 2004	3/182	14/174	15.77%	0.2[0.06,0.7]
Harter 2002	6/120	10/113	11.34%	0.56[0.21,1.5]
Jaeger 2001	1/25	1/25	1.1%	1[0.07,15.12]
Jaeger 2005	1/51	8/55	8.48%	0.13[0.02,1.04]
Logghe 1997	17/338	15/342	16.42%	1.15[0.58,2.26]
Ostendorf 2005	3/90	7/94	7.54%	0.45[0.12,1.68]
Subtotal (95% CI)	**1046**	**1036**	**100%**	**0.5[0.36,0.71]**



Total events: 46 (Impregnated group), 90 (Non-impregnated group)

Heterogeneity: $Tau^2=0$; $Chi^2=10.62$, df=7(P=0.16); $I^2=34.08\%$

Test for overall effect: Z=3.94(P<0.0001)

This review confirms the effectiveness of antimicrobial CVCs in reducing rates of CRBSI and catheter colonization. However, the magnitude of benefits regarding catheter colonization varied according to setting, with significant benefits only in studies conducted in ICUs. A comparatively smaller body of evidence suggests that antimicrobial CVCs do not appear to reduce clinically diagnosed sepsis or mortality significantly. Our findings call for caution in routinely recommending the use of antimicrobial-impregnated CVCs across all settings. Further randomized controlled trials assessing antimicrobial CVCs should include important clinical outcomes like the overall rates of sepsis and mortality.

Recommandations

Les directives générales concernant le placement et la gestion du cathéter veineux central sont susceptibles d'être applicables chez les patients cancéreux gravement malades (Grade C, forte recommandation).

3. Intégration des soins de soutien en soins intensifs

- Neuf essais contrôlés randomisés ont montré l'importance des soins de soutien et palliatifs précoces dans la prise en charge des patients atteints de cancer. Ils se sont concentrés sur la prise en charge globale des patients, en dehors du contexte spécifique des soins intensifs.
- Le recours aux soins de support est souvent insuffisant et initié tardivement dans l'histoire du cancer.

Integration of oncology and palliative care: a *Lancet Oncology* Commission

Stein Kaasa, Jon H Loge*, Matti Aapro, Tit Albreht, Rebecca Anderson, Eduardo Bruera, Cinzia Brunelli, Augusto Caraceni, Andrés Cervantes, David C Currow, Luc Deliens, Marie Fallon, Xavier Gómez-Batiste, Kjersti S Grotmol, Breffni Hannon, Dagny F Haugen, Irene J Higginson, Marianne J Hjermstad, David Hui, Karin Jordan, Geana P Kurita, Philip J Larkin, Guido Miccinesi, Friedemann Nauck, Rade Pribakovic, Gary Rodin, Per Sjøgren, Patrick Stone, Camilla Zimmermann, Tonje Lundeby*

Full integration of oncology and palliative care relies on the specific knowledge and skills of two modes of care: the tumour-directed approach, the main focus of which is on treating the disease; and the host-directed approach, which focuses on the patient with the disease. This Commission addresses how to combine these two paradigms to achieve the best outcome of patient care. Randomised clinical trials on integration of oncology and palliative care point to health gains: improved survival and symptom control, less anxiety and depression, reduced use of futile chemotherapy at the end of life, improved family satisfaction and quality of life, and improved use of health-care resources. Early delivery of patient-directed care by specialist palliative care teams alongside tumour-directed treatment promotes patient-centred care. Systematic assessment and use of patient-reported outcomes and active patient involvement in

Lancet Oncol 2018; 19: e588–653

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See **Comment** page e565, e568, e570, and e572

*Contributed equally

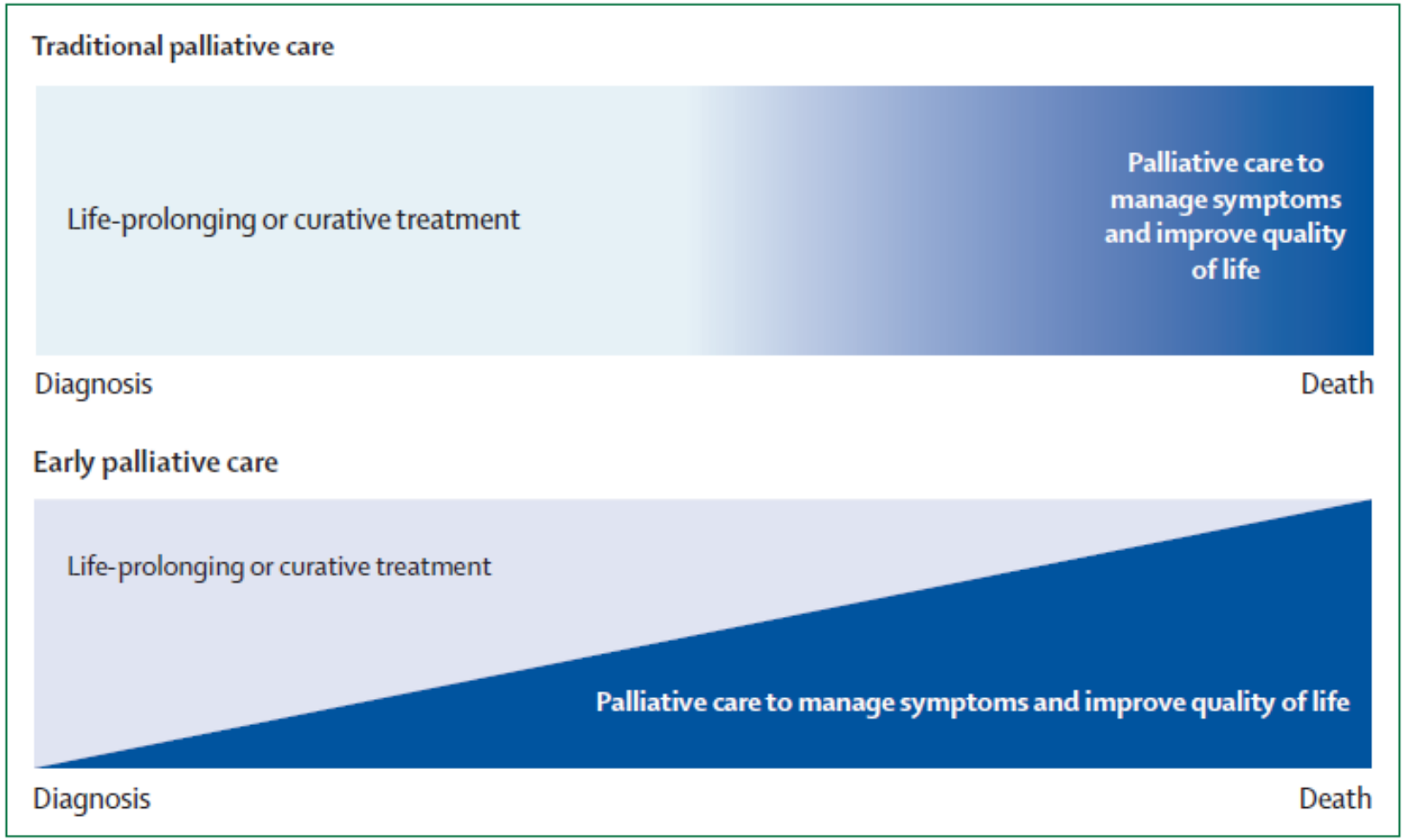

Figure 1: Traditional versus early palliative care

	Jordhøy et al (2000)[47]	Temel et al (2010)[3]	Zimmermann et al (2014)[5]	Bakitas et al (2015)[48]	Maltoni et al (2016)[49]	Temel et al (2017)[50]	Grønvold et al (2017)[51]
Clinical structure							
Palliative care inpatient consultation team	Y	Y	Y	Y	..	Y	Y
Palliative care outpatient clinic	Y	Y	Y	Y	Y	Y	Y
Community-based care or home palliative care	Y	..	Y	..	..	..	..
Clinical processes							
Multidisciplinary specialised palliative care team	Y	Y	Y	Y	Y	Y	Y
Routine symptom screening in the outpatient oncology clinic	..	..	..	..	..	..	..
Administration of systemic cancer therapy (eg, chemotherapy and targeted agents) possible in patients admitted to palliative care service	Y	Y	Y	Y	Y	Y	Y
Follow prespecified palliative care guidelines	Y	Y	..	..	Y	Y	Y
Early referral to palliative care	Y	Y	Y	Y	Y	Y	Y
Availability of clinical care pathways (automatic triggers) for palliative care referral	..	..	..	..	..	..	..
Palliative care team routinely involved in multidisciplinary tumour conference for patient case discussions	..	Y	..	..	..	..	..
Communication, cooperation, and coordination between palliative and oncology service	Y	Y	..	..	Y	..	..
Routine discussion of prognosis, advance care planning with goals of care	Y	Y	Y	Y	Y	Y	Y

Y=presence of component in trial. Table adapted from Hui and colleagues.[44,52]

Table 1: **Components of integration from seven randomised trials**

Recommendations for immediate action

In order to develop better integration of oncology and palliative care, WHO and professional organisations (European Association of Palliative Care [EAPC], Worldwide Palliative Care Alliance [WPCA], International Association for Hospice and Palliative Care [IAHPC], European Oncology Nursing Society [EONS], European Society for Radiotherapy and Oncology [ESTRO] and American Society of Clinical Oncology [ASCO], among others) should work together to establish consensus on structure and implementation plans to guide policy makers based on present best knowledge for the following areas:

- Convergent policies worldwide addressing integration of oncology and palliative care
- Organisational structures of early integration of oncology and palliative care in hospitals
- Organisational structure of early integration and collaboration between hospitals and community care in oncology or palliative care, or both, at global level need to be developed

Recommandations

- Tous les patients atteints d'un cancer en phase critique devraient recevoir des soins de soutien optimaux avant, pendant et après leur séjour à l'USI, en accord avec leurs souhaits en termes d'intensité des soins, de capacités de récupération et de qualité de vie à court et moyen terme (Grade C, forte recommandation).
- Les soins de support devraient probablement être instaurés précocement chez les patients atteints de cancer (Grade C, recommandation forte).

Le choix d'un modèle intégratif, consultatif ou mixte se fait en fonction des possibilités locales et de l'existence d'un suivi pluridisciplinaire préalable (oncologue ou hématologue, réanimateur, spécialiste en soins palliatifs). Les programmes de formation initiale et continue en soins de support/palliatifs pour les équipes de réanimation, d'oncologie et d'hématologie doivent être encouragés.

4. Quels acteurs devraient être impliqués dans la prise en charge des patients atteints d'un cancer en état critique ?

Recommandations

Il convient d'envisager une collaboration étroite, pluridisciplinaire et avancée tout au long de l'anamnèse cancéreuse incluant au moins l'oncologue/hématologue et l'intensiviste, si nécessaire élargie à d'autres spécialités, pour améliorer la fluidité, l'efficacité et la qualité de la prise en charge des patients atteints d'un cancer en état critique (Grade C, recommandation forte).

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ORIGINAL REPORT

Effects of Organizational Characteristics on Outcomes and Resource Use in Patients With Cancer Admitted to Intensive Care Units

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ABSTRACT

Purpose

To investigate the impact of organizational characteristics and processes of care on hospital mortality and resource use in patients with cancer admitted to intensive care units (ICUs).

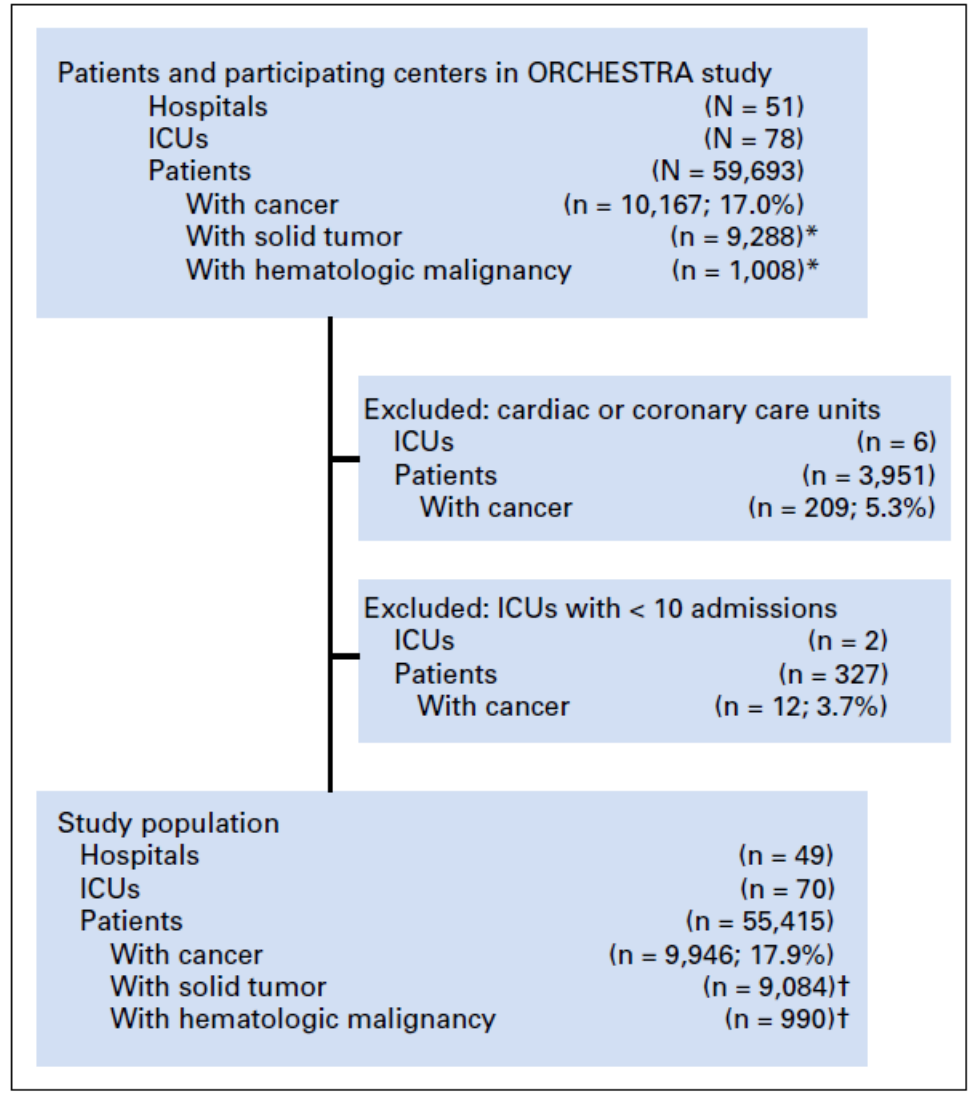

Fig 1. Study diagram. (*) Patients with both solid tumor and hematologic malignancy (n = 129). (†) Patients with both solid tumor and hematologic malignancy (n = 128). ICUs, intensive care units.

Table 1. General ICU Organizational, Structural, and Process Characteristics and Comparisons Between General Hospitals and Referral Cancer Centers

Characteristic	No. (%)			*P*
	All ICUs (N = 70)	General Hospitals (n = 51)	Cancer Centers (n = 19)	
Hospital and ICU characteristics				
Hospital type				< .001
Private, for profit	52 (74)	44 (86)	8 (42)	
Private, philanthropic	14 (20)	4 (8)	10 (53)	
Public	4 (6)	3 (6)	8 (42)	
Training programs in critical care				.058
No	33 (47)	28 (55)	5 (26)	
Yes	37 (53)	23 (45)	14 (74)	
Medical–surgical ICU				.717
No	10 (14)	8 (16)	2 (11)	
Yes	60 (86)	43 (84)	17 (89)	
No. of active ICU beds				.953
Mean ± SD	18 ± 12	18 ± 11	19 ± 13	
Median	15	16	12	
IQR	10-24	10-22	10-30	
≤ 10	21 (30)	16 (31)	5 (26)	.904
11-20	27 (39)	19 (37)	8 (42)	
> 20	22 (31)	16 (31)	6 (32)	
ICU bed occupancy rate, %				.807
Mean ± SD	73 ± 14	72 ± 15	73 ± 12	
Median	73	73	73	

Table 3. Main Patients' Characteristics and Outcomes and Comparisons Between ICUs Located in General Hospitals and Referral Cancer Centers

Characteristic	No. (%)			*P*
	All ICUs (N = 70)	General Hospitals (n = 51)	Cancer Centers (n = 19)	
No. of patients	9,946	4,734 (47.6)	5,212 (52.4)	
Age, years				< .001
Mean ± SD	64 ± 16.1	65 ± 616.1	63.7 ± 16.3	
Median	66	67	65	
IQR	55-77	56-78	54-76	
< 45	1,179 (11.9)	508 (10.7)	671 (12.9)	< .001
45-64	3,409 (34.3)	1,573 (33.2)	1,836 (35.2)	
65-74	2,373 (23.9)	115 (23.6)	1,258 (24.1)	
75-84	1,993 (20.0)	998 (21.1)	995 (19.1)	
≥ 85	992 (10.0)	540 (11.4)	452 (8.7)	
Sex				.146
Female	4,753 (47.8)	2,299 (48.6)	2,454 (47.1)	
Male	5,193 (52.2)	2,435 (51.4)	2,758 (52.9)	
Health insurance coverage				< .001
Public	1,973 (19.8)	336 (7.1)	1,637 (31.4)	
Private	6,795 (68.3)	3,818 (80.7)	2,977 (57.1)	
Admission costs paid with patient's own resources	1,178 (11.8)	580 (12.3)	598 (11.5)	
Type of cancer				.002
Solid, locoregional	6,433 (64.7)	2,978 (62.9)	3,455 (66.3)	
Solid, metastatic	2,523 (25.4)	1,267 (26.8)	1,256 (24.1)	
Hematologic	990 (10.0)	489 (10.3)	501 (9.6)	

Source of ICU admission				
Operating room	4,751 (47.8)	1,828 (38.6)	2,923 (56.1)	
Emergency department	3,152 (31.7)	2,067 (43.7)	1,085 (20.8)	
Ward or floor	1,575 (15.8)	666 (14.1)	909 (17.4)	
Transfer from other hospital	250 (2.5)	102 (2.2)	148 (2.8)	
Other	218 (2.2)	71 (1.5)	147 (2.8)	
Hospital days before ICU admission				< .001
Mean ± SD	4.1 ± 20.3	4.1 ± 25.7	4.1 ± 13.6	
Median	1	1	1	
IQR	0-2	0-1	0-3	
Admission diagnostic category				< .001
Scheduled surgery	4,446 (44.7)	1,724 (36.4)	2,722 (52.2)	
Emergency surgery	483 (4.9)	201 (4.2)	282 (5.4)	
Cardiovascular*	626 (6.3)	380 (8.0)	246 (4.7)	
Sepsis*	1,761 (17.7)	906 (19.1)	855 (16.4)	
Neurologic*	542 (5.4)	288 (6.1)	254 (4.9)	
Respiratory*	612 (6.2)	383 (8.1)	229 (4.4)	
Renal or metabolic*	264 (2.7)	146 (3.1)	118 (2.3)	
GI*	440 (4.4)	251 (5.3)	189 (3.6)	
Other medical admission*	772 (7.8)	455 (9.6)	317 (6.1)	
SAPS 3, points				< .001
Mean ± SD	48.8 ± 16.8	49.2 ± 15.9	48.4 ± 17.5	
Median	47	49	45	
IQR	36-59	37-59	35-59	
SOFA score on day 1, points				< .001
Mean ± SD	3.1 ± 3.3	2.7 ± 3.2	3.5 ± 3.5	
Median	2	1	3	
IQR	0-5	0-4	1-5	

Table 3. Main Patients' Characteristics and Outcomes and Comparisons Between ICUs Located in General Hospitals and Referral Cancer Centers (continued)

Characteristic	No. (%)			*P*
	All ICUs (N = 70)	General Hospitals (n = 51)	Cancer Centers (n = 19)	
Support on day 1				
MV	2,051 (20.6)	790 (16.7)	1,261 (24.2)	< .001
Noninvasive ventilation	1,131 (11.4)	375 (7.9)	756 (14.5)	< .001
Renal replacement therapy	263 (2.6)	129 (2.7)	134 (2.6)	.678
Vasopressors	1,739 (17.5)	630 (13.3)	1,109 (21.3)	< .001
ICU LOS, days				< .001
Mean ± SD	5.3 ± 9.6	5.9 ± 10.4	4.7 ± 8.8	
Median	3	3	2	
IQR	1-5	2-6	1-5	
Hospital LOS, days				< .001
Mean ± SD	19.0 ± 31.2	19.5 ± 35.6	18.5 ± 26.3	
Median	10	10	10	
IQR	5-22	5-22	6-22	
ICU mortality	1,578 (15.9)	782 (16.5)	796 (15.3)	.095
Hospital mortality	2,531 (25.4)	1,237 (26.1)	1,294 (24.8)	.140
Destination at hospital discharge				< .001
Home	6,446 (64.8)	3,298 (69.7)	3,148 (60.4)	
Other hospital	72 (0.7)	41 (0.9)	31 (0.6)	
Hospice or home care	47 (0.4)	28 (0.6)	19 (0.3)	
Other or unknown	850 (8.5)	130 (2.7)	720 (13.8)	
Died	2,531 (25.4)	1,237 (26.1)	1,294 (24.8)	

NOTE. Comparisons between general hospitals and general cancer centers were performed using *t* or Mann-Whitney test for continuous variables and χ^2 test for categorical variables, as appropriate.

Abbreviations: ECOG PS, Eastern Cooperative Oncology Group performance status; ICU, intensive care unit; IQR, interquartile range; LOS, length of stay; MV, mechanical ventilation; SAPS, Simplified Acute Physiology Score; SD, standard deviation; SOFA, Sequential Organ Failure Assessment.

*Admission category refers to medical diagnosis only.

Table 4. Multilevel Multivariable Analysis of Characteristics Associated With Hospital Mortality

Variable	OR (95% CI)	*P*
Patient level		
Age, years	1.015 (1.011 to 1.019)	< .001
Admission diagnostic category		
Scheduled surgery	1.000	
Emergency surgery	2.623 (2.015 to 3.414)	< .001
Cardiovascular*	3.685 (2.827 to 4.802)	< .001
Sepsis*	6.876 (5.712 to 8.276)	< .001
Neurologic*	10.651 (8.335 to 13.611)	< .001
Respiratory*	6.105 (4.765 to 7.823)	< .001
Renal or metabolic*	5.099 (3.674 to 7.078)	< .001
GI*	6.337 (4.842 to 8.293)	< .001
Other medical admission*	7.476 (5.967 to 9.368)	< .001
Type of cancer		
Solid, locoregional	1.000	
Solid, metastatic	2.745 (2.403 to 3.135)	< .001
Hematologic	1.628 (1.353 to 1.960)	< .001
ECOG PS before hospital admission		
0-1	1.000	
2	1.300 (1.119 to 1.511)	< .001
3-4	1.995 (1.612 to 2.468)	< .001
SOFA score, points	1.178 (1.153 to 1.204)	< .001
MV on day 1		
No	1.000	
Yes	2.847 (2.433 to 3.332)	< .001
Center level		
Type of hospital		
General	1.000	
Referral cancer center	1.210 (0.893 to 1.638)	.217
Training programs in critical care in ICU		
No	1.000	
Yes	1.376 (1.048 to 1.808)	.021
Presence of clinical pharmacist in ICU		
No	1.000	
Yes	0.666 (0.492 to 0.900)	.008
Daily meetings between oncologists and intensivists for care planning in all patients		
No	1.000	
Yes	0.688 (0.520 to 0.910)	.009
Implemented clinical protocols†	0.923 (0.865 to 0.984)	.015

Abbreviations: ECOG PS, Eastern Cooperative Oncology Group performance status; ICU, intensive care unit; MV, mechanical ventilation; OR, odds ratio; SOFA, Sequential Organ Failure Score.

*Medical admission.

†For the purposes of the multivariable analysis, the number of clinical protocols was truncated at eight (range, zero to 10).

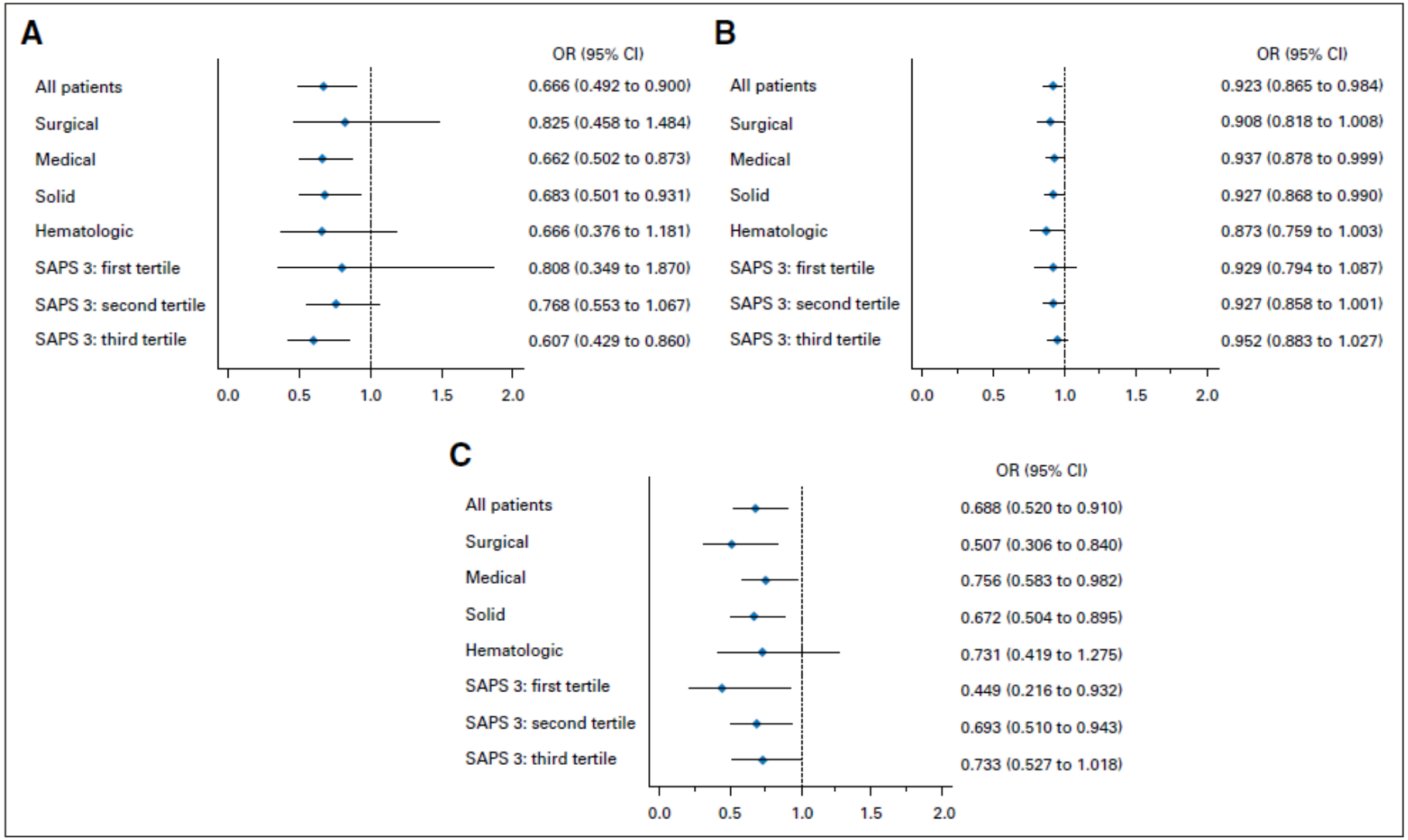

Fig 2. Forest plot shows association of organizational characteristics and hospital mortality in all patients and subgroups based on multilevel, multivariable analyses. Results for (A) the presence of clinical pharmacists in the ICU, (B) the number of implemented protocols, and (C) the occurrence of daily meetings between oncologists and intensivists for care planning. Estimates were adjusted for age, Sequential Organ Failure Assessment score, need for mechanical ventilation, previous Eastern Cooperative Oncology Group performance status, admission diagnostic category, training programs in critical care, ICU type, average ratio of beds to graduate nurses, and type of hospital (cancer center *v* general). ICU, intensive care unit; SAPS, Simplified Acute Physiology Score.

In conclusion, we demonstrated that ICU organizational and process characteristics, namely the availability of clinical pharmacists in the ICU, the implementation of protocols, and shared care planning between oncologists and intensivists, were associated with higher survival and more efficient resource use. These are potential targets to improve the care for patients with cancer.