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北京天坛医院神经病学中心
神经重症医学科

预防急性卒中后DVT

2009 CLOTS I

Effectiveness of thigh-length graduated compression stockings to reduce the risk of deep vein thrombosis after stroke (CLOTS trial 1): a multicentre, randomised controlled trial

*The CLOTS Trials Collaboration**

Summary

Background Deep vein thrombosis (DVT) and pulmonary embolism are common after stroke. In small trials of patients undergoing surgery, graduated compression stockings (GCS) reduce the risk of DVT. National stroke guidelines extrapolating from these trials recommend their use in patients with stroke despite insufficient evidence. We assessed the effectiveness of thigh-length GCS to reduce DVT after stroke.

Methods In this outcome-blinded, randomised controlled trial, 2518 patients who were admitted to hospital within 1 week of an acute stroke and who were immobile were enrolled from 64 centres in the UK, Italy, and Australia. Patients were allocated via a central randomisation system to routine care plus thigh-length GCS (n=1256) or to routine care plus avoidance of GCS (n=1262). A technician who was blinded to treatment allocation undertook compression Doppler ultrasound of both legs at about 7–10 days and, when practical, again at 25–30 days after enrolment. The primary outcome was the occurrence of symptomatic or asymptomatic DVT in the popliteal or femoral veins. Analyses were by intention to treat. This study is registered, number ISRCTN28163533.

Findings All patients were included in the analyses. The primary outcome occurred in 126 (10·0%) patients allocated to thigh-length GCS and in 133 (10·5%) allocated to avoid GCS, resulting in a non-significant absolute reduction in risk of 0·5% (95% CI −1·9% to 2·9%). Skin breaks, ulcers, blisters, and skin necrosis were significantly more common in patients allocated to GCS than in those allocated to avoid their use (64 [5%] *vs* 16 [1%]; odds ratio 4·18, 95% CI 2·40–7·27).

Interpretation These data do not lend support to the use of thigh-length GCS in patients admitted to hospital with acute stroke. National guidelines for stroke might need to be revised on the basis of these results.

Funding Medical Research Council (UK), Chief Scientist Office of Scottish Government, Chest Heart and Stroke Scotland, Tyco Healthcare (Covidien) USA, and UK Stroke Research Network.

Introduction

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are common complications of admission to hospital for surgery or acute medical problems, and result in many avoidable deaths.[1] These complications emphasise the potential importance of measures that might reduce the risk of venous thromboembolism, such as anticoagulation, external compression with graduated compression stockings (GCS), and intermittent pneumatic compression. Up to 42% of patients admitted with stroke develop venous thromboembolism.[2] Although use of anticoagulants reduces this risk, the associated excess of intracranial and extracranial haemorrhages largely offsets any benefit.[3] Thus, most national stroke guidelines do not recommend routine use of anticoagulants in ischaemic stroke, but instead recommend the use of GCS.[4–6] However, guidelines vary considerably, with some recommending anticoagulation and only GCS in patients unsuitable for anticoagulation, and others recommending routine stocking use but avoidance of anticoagulants. The UK National Institute for Health and Clinical Excellence (NICE) has recently drafted guidelines for reducing the risk of venous thromboembolism which included the recommendation: "For patients diagnosed with stroke, offer mechanical VTE prophylaxis (thigh-length anti-embolism stockings, intermittent pneumatic compression devices or foot impulse devices) from admission until the patient's mobility is no longer increasing or until discharge".[7]

A systematic review[8] identified 17 single-centre randomised controlled trials in patients admitted to hospital in which 2412 patients or legs were randomly assigned to GCS or control. GCS was associated with a 63% (95% CI 52–70) reduction in the odds of (mainly distal) DVT. 15 of the 17 trials were in surgical patients, one was in acute medical patients (n= 80).[10] Only one trial was in patients with stroke[9] and in this trial, seven of 65 patients (10·8%) allocated GCS and seven of 32 (21·9%) allocated to avoid GCS had DVTs detected on Doppler ultrasound within 10 days of enrolment (odds ratio 0·43, 95% CI 0·14–1·36). 14 of the 17 trials tested thigh-length GCS, two tested below-knee GCS and, in one, the length was not specified. A systematic review of external compression specifically in stroke[17] did not identify any other randomised controlled trials investigating GCS. For patients with stroke, unlike surgical patients, external compression cannot be applied

2010 CLOTS II

Annals of Internal Medicine | ORIGINAL RESEARCH

Thigh-Length Versus Below-Knee Stockings for Deep Venous Thrombosis Prophylaxis After Stroke

A Randomized Trial

The CLOTS (Clots In Legs Or sTockings after Stroke) Trial Collaboration*

Background: Graduated compression stockings are widely used for deep venous thrombosis (DVT) prophylaxis. Although below-knee stockings are used more often than thigh-length stockings, no reliable evidence indicates that they are as effective as thigh-length stockings.

Objective: To compare the effectiveness of thigh-length stockings with that of below-knee stockings for preventing proximal DVT in immobile, hospitalized patients with stroke.

Design: Parallel-group trial with centralized randomization (minimization within centers) to ensure allocation concealment. The ultrasonographers who looked for DVT were blinded, but the patients and caregivers were not. (Controlled-trials.com registration number: ISRCTN28163533)

Setting: 112 hospitals in 9 countries.

Patients: 3114 immobile patients hospitalized with acute stroke between January 2002 and May 2009.

Intervention: 1552 patients received thigh-length stockings and 1562 patients received below-knee stockings to wear while they were in the hospital.

Measurements: Ultrasonographers performed compression duplex ultrasonography in 1406 patients (96% of survivors) in each treatment group between 7 and 10 days after enrollment. They performed a second scan in 643 patients in the thigh-length stockings group and 639 in the below-knee stockings group at about 25 to 30 days. The primary outcome was symptomatic or asymptomatic DVT in the popliteal or femoral veins, detected on either scan.

Results: Patients were retained in their assigned group for all analyses. The primary outcome occurred in 98 patients (6.3%) who received thigh-length stockings and 138 (8.8%) who received below-knee stockings (absolute difference, 2.5 percentage points [95% CI, 0.7 to 4.4 percentage points]; $P = 0.008$), an odds reduction of 31% (CI, 9% to 47%). Seventy-five percent of patients in both groups wore the stockings for 30 days or until they were discharged, died, or regained mobility. Skin breaks occurred in 61 patients who received thigh-length stockings (3.9%) and 45 (2.9%) who received below-knee stockings.

Limitation: Blinding was incomplete, 2 scans were not obtained for all enrolled patients, and the trial was stopped before the target accrual was reached.

Conclusion: Proximal DVT occurs more often in patients with stroke who wear below-knee stockings than in those who wear thigh-length stockings.

Primary Funding Source: Medical Research Council of the United Kingdom, Chief Scientist Office of the Scottish Government, and Chest Heart and Stroke Scotland.

Ann Intern Med. 2010;153:553-562. www.annals.org

For author affiliation, see end of text.

* For a list of the CLOTS Trial collaborators, see the **Appendix** (available at www.annals.org).

This article was published at www.annals.org on 21 September 2010.

Deep venous thrombosis (DVT) and pulmonary embolism are common among patients hospitalized for surgery and those with acute medical problems associated with immobility, including stroke. Deep venous thrombosis may lead to pulmonary emboli, a frequent cause of avoidable deaths (1). Graduated compression stockings, either alone or in combination with intermittent pneumatic compression or anticoagulants, are widely used to reduce the risk for DVT. The recommendations to use these stockings are based on systematic reviews of randomized, controlled trials (2–4), the most recent of which shows that stockings are associated with a 63% (95% CI, 52% to 70%) reduction in the odds of developing DVT. However, 15 of the 17 trials reviewed were in surgical patients, 1 was in 80 patients with acute myocardial infarction (5), and only 1 was in patients with stroke (97 patients) (6). Fourteen of the 17 trials (91% of patients) evaluated thigh-length T.E.D. stockings (Tyco Healthcare [now Covidien], Mansfield, Massachusetts) (7).

We set up the CLOTS (Clots in Legs Or sTockings after Stroke) Trials (www.clotstrial.com), 3 multicenter randomized trials that shared randomization, data collection, and follow-up systems, to assess the effectiveness of external compression in patients with stroke (8). All 3 trials tested the effect of adding external leg compression to routine care. We compared thigh-length stockings with no stockings in 2518 patients in CLOTS Trial 1 (8) and showed that thigh-length stockings were associated with a reduced absolute risk for proximal DVT of only 0.5 percentage points (CI, −1.9 to 2.9 percentage points; $P = 0.88$), which is equivalent to a number needed to treat of

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2013 CLOTS III

Effectiveness of intermittent pneumatic compression in reduction of risk of deep vein thrombosis in patients who have had a stroke (CLOTS 3): a multicentre randomised controlled trial

*CLOTS (Clots in Legs Or sTockings after Stroke) Trials Collaboration**

Summary

Background Venous thromboembolism is a common, potentially avoidable cause of death and morbidity in patients in hospital, including those with stroke. In surgical patients, intermittent pneumatic compression (IPC) reduces the risk of deep vein thrombosis (DVT), but no reliable evidence exists about its effectiveness in patients who have had a stroke. We assessed the effectiveness of IPC to reduce the risk of DVT in patients who have had a stroke.

Methods The CLOTS 3 trial is a multicentre parallel group randomised trial assessing IPC in immobile patients (ie, who cannot walk to the toilet without the help of another person) with acute stroke. We enrolled patients from day 0 to day 3 of admission and allocated them via a central randomisation system (ratio 1:1) to receive either IPC or no IPC. A technician who was masked to treatment allocation did a compression duplex ultrasound (CDU) of both legs at 7–10 days and, wherever practical, at 25–30 days after enrolment. Caregivers and patients were not masked to treatment assignment. Patients were followed up for 6 months to determine survival and later symptomatic venous thromboembolism. The primary outcome was a DVT in the proximal veins detected on a screening CDU or any symptomatic DVT in the proximal veins, confirmed on imaging, within 30 days of randomisation. Patients were analysed according to their treatment allocation. Trial registration: ISRCTN93529999.

Findings Between Dec 8, 2008, and Sept 6, 2012, 2876 patients were enrolled in 94 centres in the UK. The included patients were broadly representative of immobile stroke patients admitted to hospital and had a median age of 76 years (IQR 67–84). The primary outcome occurred in 122 (8·5%) of 1438 patients allocated IPC and 174 (12·1%) of 1438 patients allocated no IPC; an absolute reduction in risk of 3·6% (95% CI 1·4–5·8). Excluding the 323 patients who died before any primary outcome and 41 without any screening CDU, the adjusted OR for the comparison of 122 of 1267 patients *vs* 174 of 1245 patients was 0·65 (95% CI 0·51–0·84; p=0·001). Deaths in the treatment period occurred in 156 (11%) patients allocated IPC and 189 (13%) patients allocated no IPC died within the 30 days of treatment period (p=0·057); skin breaks on the legs were reported in 44 (3%) patients allocated IPC and in 20 (1%) patients allocated no IPC (p=0·002); falls with injury were reported in 33 (2%) patients in the IPC group and in 24 (2%) patients in the no-IPC group (p=0·221).

Interpretation IPC is an effective method of reducing the risk of DVT and possibly improving survival in a wide variety of patients who are immobile after stroke.

Funding National Institute of Health Research (NIHR) Health Technology Assessment (HTA) programme, UK; Chief Scientist Office of Scottish Government; Covidien (MA, USA).

Introduction

Venous thromboembolism is one of the most important, potentially preventable, causes of death and morbidity in patients in hospital.[1] Although its importance has long been recognised in patients undergoing surgery, it is now clear that medical patients (sometimes referred to as non-surgical patients) also have a high risk of venous thromboembolism. Patients who have had a stroke are at especially high risk; in prospective studies, venous thromboembolism has been detected in 20–42% of patients in hospital who have had a stroke.[2–4] Most healthcare systems in developed countries have established guidelines promoting routine assessments of risk of venous thromboembolism on hospital admission and the initiation of prophylaxis in high-risk patients.[5–7] Prophylaxis with antithrombotic drugs or physical methods, such as intermittent pneumatic compression (IPC), reduces the risks of deep vein thrombosis (DVT) in patients undergoing surgery; but the balance of risk and benefit for these approaches in medical patients is more contentious.[5,8,9] After stroke, graduated compression stockings are not effective, and the guideline-recommended strategy of selective use of anticoagulants in patients at high risk of venous thromboembolism and low risk of bleeding is impossible to achieve in practice because of the overlap of the factors that predict venous thromboembolism and those predicting bleeding risk.[3,10]

CLOTS I：长腿GCS

Effectiveness of thigh-length graduated compression stockings to reduce the risk of deep vein thrombosis after stroke (CLOTS trial 1): a multicentre, randomised controlled trial

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Summary

Background Deep vein thrombosis (DVT) and pulmonary embolism are common after stroke. In small trials of patients undergoing surgery, graduated compression stockings (GCS) reduce the risk of DVT. National stroke guidelines extrapolating from these trials recommend their use in patients with stroke despite insufficient evidence. We assessed the effectiveness of thigh-length GCS to reduce DVT after stroke.

Methods In this outcome-blinded, randomised controlled trial, 2518 patients who were admitted to hospital within 1 week of an acute stroke and who were immobile were enrolled from 64 centres in the UK, Italy, and Australia. Patients were allocated via a central randomisation system to routine care plus thigh-length GCS (n=1256) or to routine care plus avoidance of GCS (n=1262). A technician who was blinded to treatment allocation undertook compression Doppler ultrasound of both legs at about 7–10 days and, when practical, again at 25–30 days after enrolment. The primary outcome was the occurrence of symptomatic or asymptomatic DVT in the popliteal or femoral veins. Analyses were by intention to treat. This study is registered, number ISRCTN28163533.

Findings All patients were included in the analyses. The primary outcome occurred in 126 (10·0%) patients allocated to thigh-length GCS and in 133 (10·5%) allocated to avoid GCS, resulting in a non-significant absolute reduction in risk of 0·5% (95% CI −1·9% to 2·9%). Skin breaks, ulcers, blisters, and skin necrosis were significantly more common in patients allocated to GCS than in those allocated to avoid their use (64 [5%] *vs* 16 [1%]; odds ratio 4·18, 95% CI 2·46–7·27).

Interpretation These data do not lend support to the use of thigh-length GCS in patients admitted to hospital with acute stroke. National guidelines for stroke might need to be revised on the basis of these results.

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A systematic review[8] identified 17 single-centre randomised controlled trials in patients admitted to hospital in which 2412 patients or legs were randomly assigned to GCS or control. GCS was associated with a 63% (95% CI 52–70) reduction in the odds of (mainly distal) DVT. 15 of the 17 trials were in surgical patients, one was in acute medical patients (n=80).[9] Only one trial was in patients with stroke[10] and in this trial, seven of 65 patients (10·8%) allocated GCS and seven of 32 (21·9%) allocated to avoid GCS had DVTs detected on Doppler ultrasound within 10 days of enrolment (odds ratio 0·43, 95% CI 0·14–1·36). 14 of the 17 trials tested thigh-length GCS, two tested below-knee GCS and, in one, the length was not specified. A systematic review of external compression specifically in stroke[11] did not identify any other randomised controlled trials investigating GCS. For patients with stroke, unlike surgical patients, external compression cannot be applied

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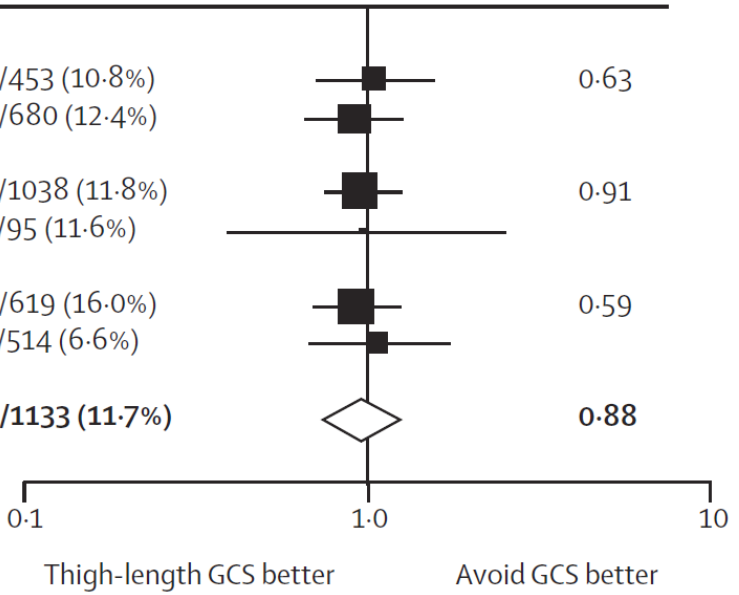
Lancet. 2009; 373 :1958-65

北京天坛医院
Beijing Tiantan Hospital

CLOTS I：长腿GCS不能降低急性卒中患者DVT

	Thigh-length GCS	Avoid GCS	Odds ratio
Primary outcome			
Proximal DVT	126 (10·0%)	133 (10·5%)	..
Primary outcomes within 14 days			
Post-hoc analysis restricting follow-up to 14 days†	87 (6·9%)	95 (7·5%)	..

	Thigh-length GCS	Avoid GCS	p value
Delay from onset to randomisation			
0–1 day	54/457 (11·8%)	49/453 (10·8%)	0·63
≥2 days	72/643 (11·2%)	84/680 (12·4%)	
Heparin, warfarin, alteplase			
No	116/1017 (11·4%)	122/1038 (11·8%)	0·91
Yes	10/83 (12·0%)	11/95 (11·6%)	
Can lift both legs off bed			
No	90/600 (15·0%)	99/619 (16·0%)	0·59
Yes	36/500 (7·2%)	34/514 (6·6%)	
All	**126/1100 (11·5%)**	**133/1133 (11·7%)**	**0·88**



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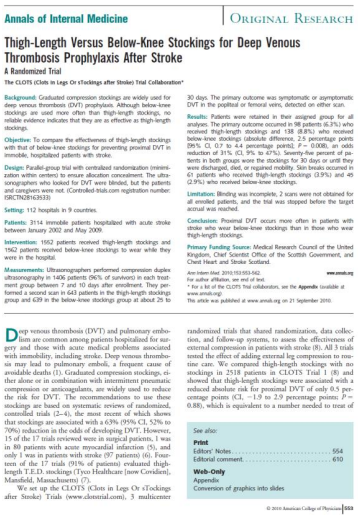
CLOTS II：长腿 vs. 短腿GCS



Annals of Internal Medicine | ORIGINAL RESEARCH

Thigh-Length Versus Below-Knee Stockings for Deep Venous Thrombosis Prophylaxis After Stroke

A Randomized Trial

The CLOTS (Clots in Legs Or sTockings after Stroke) Trial Collaboration*

Background: Graduated compression stockings are widely used for deep venous thrombosis (DVT) prophylaxis. Although below-knee stockings are used more often than thigh-length stockings, no reliable evidence indicates that they are as effective as thigh-length stockings.

Objective: To compare the effectiveness of thigh-length stockings with that of below-knee stockings for preventing proximal DVT in immobile, hospitalized patients with stroke.

Design: Parallel-group trial with centralized randomization (minimization within centers) to ensure allocation concealment. The ultrasonographers who looked for DVT were blinded, but the patients and caregivers were not. (Controlled-trials.com registration number: ISRCTN28163933)

Setting: 112 hospitals in 9 countries.

Patients: 3114 immobile patients hospitalized with acute stroke between January 2002 and May 2009.

Intervention: 1562 patients received thigh-length stockings and 1562 patients received below-knee stockings to wear while they were in the hospital.

Measurements: Ultrasonographers performed compression duplex ultrasonography in 1406 patients (96% of survivors) in each treatment group between 7 and 10 days after enrollment. They performed a second scan in 643 patients in the thigh-length stockings group and 639 in the below-knee stockings group at about 25 to 30 days. The primary outcome was symptomatic or asymptomatic DVT in the popliteal or femoral veins, detected on either scan.

Results: Patients were retained in their assigned group for all analyses. The primary outcome occurred in 98 patients (6.3%) who received thigh-length stockings and 138 (8.8%) who received below-knee stockings (absolute difference, 2.5 percentage points [95% CI, 0.7 to 4.4 percentage points]; $P = 0.008$), an odds reduction of 31% (CI, 9% to 47%). Seventy-five percent of patients in both groups wore the stockings for 30 days or until they were discharged, died, or regained mobility. Skin breaks occurred in 61 patients who received thigh-length stockings (3.9%) and 45 (2.9%) who received below-knee stockings.

Limitation: Blinding was incomplete, 2 scans were not obtained for all enrolled patients, and the trial was stopped before the target accrual was reached.

Conclusion: Proximal DVT occurs more often in patients with stroke who wear below-knee stockings than in those who wear thigh-length stockings.

Primary Funding Source: Medical Research Council of the United Kingdom, Chief Scientist Office of the Scottish Government, and Chest Heart and Stroke Scotland.

Ann Intern Med. 2010;153:553-562. www.annals.org

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Ann Intern Med. 2010;153:553-562.

北京天坛医院
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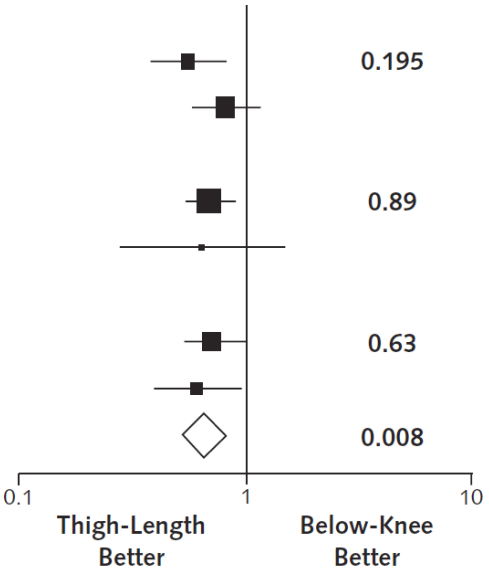
CLOTS II：与短腿相比，长腿GCS能降低急性卒中患者近端DVT

Outcome	Thigh-Length	Below-Knee	Adjusted OR	*P* Value
Proximal DVT	98 (6.3)	138 (8.8)	0.69 (0.53 to 0.91)	0.008
Symptomatic proximal DVT	49 (3.2)	63 (4.0)	0.78 (0.53 to 1.14)	0.19
Asymptomatic proximal DVT	49 (3.2)	75 (4.8)	0.64 (0.44 to 0.93)	0.02
Symptomatic DVT (proximal or distal)	85 (5.5)	87 (5.6)	0.98 (0.72 to 1.33)	0.87
Any DVT (proximal or distal)	177 (11.4)	211 (13.5)	0.82 (0.67 to 1.02)	0.08
Pulmonary emboli	23 (1.5)	19 (1.2)	1.23 (0.66 to 2.26)	0.51
Any DVT or pulmonary emboli	188 (12.1)	220 (14.1)	0.84 (0.68 to 1.04)	0.11

Prespecified Subgroup	Thigh-Length Stockings, *n/N (%)*	Below-Knee Stockings, *n/N (%)*	*P* Value
Delay from onset to randomization			
0–1 d	41/605 (6.8)	66/585 (11.3)	0.195
≥2 d	57/739 (7.7)	72/766 (9.4)	
Use of antithrombotics			
No	89/1169 (7.6)	124/1174 (10.6)	0.89
Yes	9/175 (5.1)	14/177 (7.9)	
Able to lift both legs			
No	67/774 (8.7)	91/780 (11.7)	0.63
Yes	31/570 (5.4)	47/571 (8.2)	
All	98/1344 (7.3)	138/1351 (10.2)	0.008



Ann Intern Med. 2010;153:553-562.

CLOTS III：IPC vs. 无IPC

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Summary

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Methods In this outcome-blinded, randomised controlled trial, 2518 patients who were admitted to hospital within 1 week of an acute stroke and who were immobile were enrolled from 64 centres in the UK, Italy, and Australia. Patients were allocated via a central randomisation system to routine care plus thigh-length GCS (n=1256) or to routine care plus avoidance of GCS (n=1262). A technician who was blinded to treatment allocation undertook compression Doppler ultrasound of both legs at about 7–10 days and, when practical, again at 25–30 days after enrolment. The primary outcome was the occurrence of symptomatic or asymptomatic DVT in the popliteal or femoral veins. Analyses were by intention to treat. This study is registered, number ISRCTN28163533.

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Introduction

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are common complications of admission to hospital for surgery or acute medical problems, and result in many avoidable deaths.[1] These complications emphasise the potential importance of measures that might reduce the risk of venous thromboembolism, such as anticoagulation, external compression with graduated compression stockings (GCS), and intermittent pneumatic compression. Up to 42% of patients admitted with stroke develop venous thromboembolism.[2] Although use of anticoagulants reduces this risk, the associated excess of intracranial and extracranial haemorrhages largely offsets any benefit.[3] Thus, most national stroke guidelines do not recommend routine use of anticoagulants in ischaemic stroke, but instead recommend the use of GCS.[4–6] However, guidelines vary considerably, with some recommending anticoagulation and only GCS in patients unsuitable for anticoagulation, and others recommending routine stocking use but avoidance of anticoagulants. The UK National Institute for Health and Clinical Excellence (NICE) has recently drafted guidelines for reducing the risk of venous thromboembolism which included the recommendation: "For patients diagnosed with stroke, offer mechanical VTE prophylaxis (thigh-length anti-embolism stockings, intermittent pneumatic compression devices or foot impulse devices) from admission until the patient's mobility is no longer increasing or until discharge".[6]

A systematic review[7] identified 17 single-centre randomised controlled trials in patients admitted to hospital in which 2412 patients or legs were randomly assigned to GCS or control. GCS was associated with a 63% (95% CI 52–70) reduction in the odds of (mainly distal) DVT. 15 of the 17 trials were in surgical patients, one was in acute medical patients (n=80).[8] Only one trial was in patients with stroke[9] and in this trial, seven of 65 patients (10·8%) allocated GCS and seven of 32 (21·9%) allocated to avoid GCS had DVTs detected on Doppler ultrasound within 10 days of enrolment (odds ratio 0·43, 95% CI 0·14–1·36). 14 of the 17 trials tested thigh-length GCS, two tested below-knee GCS and, in one, the length was not specified. A systematic review of external compression specifically in stroke[10] did not identify any other randomised controlled trials investigating GCS. For patients with stroke, unlike surgical patients, external compression cannot be applied

- 终点盲法，RCT研究
- 入选标准：入院0-3天不能活动的急性卒中患者
- 不能活动-不能独立步行去洗手间
- 随机分组，IPC（1256例）和对照（1262例）
- IPC 24h××>30天
- 主要终点：近端DVT

Lancet 2013, 382: 516–24

北京天坛医院
Beijing Tiantan Hospital

CLOTS III：IPC能够减少急性卒中患者DVT

	IPC (n=1438)	No IPC (n=1438)	Odds ratio (95% CI)	p value
Primary outcome				
Primary outcome (proximal DVT)	122 (8·5%)	174 (12·1%)		
Secondary outcomes by 30 days or later second compression duplex ultrasound				
Dead by 30 days	156 (10·8%)	189 (13·1%)	0·80 (0·63 to 1·01)	0·057
Symptomatic proximal DVT	39 (2·7%)	49 (3·4%)	0·79 (0·51 to 1·21)	0·269
Asymptomatic proximal DVT	83 (5·8%)	125 (8·7%)	0·65 (0·48 to 0·86)	0·003
Symptomatic DVT (proximal or calf)	66 (4·6%)	90 (6·3%)	0·72 (0·52 to 0·99)	0·045
Any DVT (symptomatic or asymptomatic, proximal or calf)	233 (16·2%)	304 (21·1%)	0·72 (0·60 to 0·87)	0·001
All confirmed pulmonary embolism (imaging or autopsy)	29 (2·0%)	35 (2·4%)	0·83 (0·50 to 1·36)	0·453

Lancet 2013, 382: 516–24

ANZICS：鼻空肠管 vs. 鼻胃管

A multicenter, randomized controlled trial comparing early nasojejunal with nasogastric nutrition in critical illness*

Andrew R. Davies, MBBS; Sioeuzy S. Morrison, MPH; Michael J. Bailey, PhD; Rinaldo Bellomo, MD; David J. Cooper, MD; Gordon S. Doig, PhD; Simon R. Finfer, FCICM; Daren K. Heyland, MD; for the ENTERIC Study Investigators and the ANZICS Clinical Trials Group

Objective: Current guidelines recommend enteral nutrition in critically ill adults; however, poor gastric motility often prevents nutritional targets being met. We hypothesized that early nasojejunal nutrition would improve the delivery of enteral nutrition.

Design: Prospective, randomized, controlled trial.

Setting: Seventeen multidisciplinary, closed, medical/surgical, intensive care units in Australia.

Patients: One hundred and eighty-one mechanically ventilated adults who had elevated gastric residual volumes within 72 hrs of intensive care unit admission.

Interventions: Patients were randomly assigned to receive early nasojejunal nutrition delivered via a spontaneously migrating fine-bore nasojejunal tube, or to continued nasogastric nutrition.

Measurements and Main Results: The primary outcome was the proportion of the standardized estimated energy requirement delivered by enteral nutrition by day 5. Secondary outcomes included incidence of ventilator-associated pneumonia, gastrointestinal hemorrhage, and in-hospital mortality rate. There were 92 patients assigned to early nasojejunal nutrition and 89 to continued nasogastric nutrition. Baseline characteristics were similar. Nasojejunal tube placement into the small bowel was confirmed in 79 (87%) early nasojejunal nutrition patients after a median of 15 (interquartile range 7–32) hrs. The proportion of targeted energy delivered from enteral nutrition was 72% for the early nasojejunal nutrition and 71% for the nasogastric nutrition group (mean difference 1%, 95% confidence interval −3% to 5%, p = .66). Rates of ventilator-associated pneumonia (20% vs. 21%, p = .94), vomiting, witnessed aspiration, diarrhea, and mortality were similar. Minor, but not major, gastrointestinal hemorrhage was more common in the early nasojejunal nutrition group (12 [13%] vs. 3 [3%], p = .02).

Conclusions: In mechanically ventilated patients with mildly elevated gastric residual volumes and already receiving nasogastric nutrition, early nasojejunal nutrition did not increase energy delivery and did not appear to reduce the frequency of pneumonia. The routine use of nasojejunal nutrition in this patient group cannot be recommended. Routine placement of a nasojejunal tube in such patients is not recommended. (Crit Care Med 2012; 40: 2342–2348)

Key Words: critically ill; critical illness; enteral nutrition; nasojejunal; nutrition; randomized controlled trial

Nutritional therapy in the critically ill improves wound healing (1), reduces complication rates (2), and may even improve mortality (3). Current evidence-based clinical practice guidelines recommend that enteral nutrition (EN) be commenced through a nasogastric tube, usually within the first 24–48 hrs after intensive care unit (ICU) admission (4–7).

Observational studies have consistently shown that critically ill adults are delivered between 40%–70% of estimated energy requirements (8–12). The optimal energy delivery amount is controversial, but attempts to increase delivery are often hampered by gastric intolerance of EN. Gastric intolerance has been associated with narcotic analgesic and vasopressor infusions (13), and is an important risk factor for reduced energy delivery and hospital-acquired pneumonia (14).

Delivery of nutrition into the small bowel using a nasojejunal tube may be preferable to nasogastric delivery as the small bowel has greater absorptive capacity (15) and is less subject to impaired motility (16). Nutrition is delivered further away from the pharynx and respiratory tree, potentially reducing the risk of pneumonia from gastroesophageal regurgitation (17). Nasojejunal nutrition decreases gastric residual volumes (GRV) (18), which would be expected to lead to fewer interruptions to EN.

Studies comparing nasojejunal and nasogastric nutrition in adult ICU patients have reported inconsistent results regarding both nutritional energy delivery and occurrence rate of pneumonia (18–25). Previous trials mostly included low-risk patients (when nasogastric nutrition was unlikely to be problematic), and we considered that early nasojejunal nutrition

- 平行，随机对照研究
- 17个澳大利亚综合ICU和内外科ICU
- 入选标准：机械通气预计超过48h
- 使用麻醉剂，GRV>150ml或24h>500ml，已经开始EN
- 早期鼻空肠管（92例），鼻胃管（89例）
- 评价指标：能量摄入，VAP，胃肠道出血和死亡率

Crit Care Med 2012; 40: 2342–2348

北京天坛医院
Beijing Tiantan Hospital

ANZICS:鼻空肠管不能增加能量摄入，不降低VAP，增加胃肠出血

Table 2. Energy delivery from enteral nutrition

Variable	Nasogastric Nutrition (n = 89)	Early Nasojejunal Nutrition (n = 91)	*p*
Proportion of estimated energy requirements delivered by enteral nutrition for study period (mean, SD)	71% (19%)	72% (21%)	.66
Proportion of estimated energy requirements delivered by enteral nutrition over first 10 days (mean, SD)	71% (19%)	72% (21%)	.76
Daily energy delivered, kilocalories (mean, SD)	1444 (485)	1497 (521)	.49

Crit Care Med 2012; 40: 2342–2348

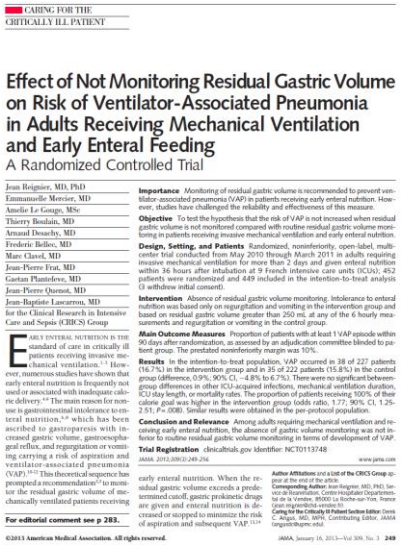
ANZICS:鼻空肠管不能增加能量摄入，不降低VAP，增加胃肠出血

Table 3. Other outcomes

Variable	Nasogastric Nutrition (n = 89)	Early Nasojejunal Nutrition (n = 91)	*p*
Ventilator-associated pneumonia by blinded adjudication panel (n, %)	19 (21%)	18 (20%)	.94
Accidental withdrawal of enteral tube (n, %)	18 (20%)	23 (25%)	.42
Vomiting (n, %)	27 (30%)	30 (33%)	.70
Witnessed aspiration (n, %)	4 (4%)	5 (5%)	.76
Abdominal distension (n, %)	18 (20%)	16 (18%)	.65
Diarrhea (n, %)	27 (30%)	26 (29%)	.79
Minor gastrointestinal hemorrhage (n, %)	3 (3%)	12 (13%)	.02
Major gastrointestinal hemorrhage (n, %)	2 (2%)	2 (2%)	.98
Duration of mechanical ventilation, days (median, IQR)	8 (5–14)	8 (6–12)	.84
Duration of intensive care unit stay, days (median, IQR)	11 (7–16)	10 (7–15)	.85
Duration of hospitalization, days (median, IQR)	24 (15–32)	20 (11–33)	.57
Hospital mortality (n, %)	12 (13%)	13 (14%)	.88

Crit Care Med 2012; 40: 2342–2348

NUTRIREA1:胃内容物残留量监测



CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding

A Randomized Controlled Trial

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for the Clinical Research in Intensive Care and Sepsis (CRICS) Group

Importance Monitoring of residual gastric volume is recommended to prevent ventilator-associated pneumonia (VAP) in patients receiving early enteral nutrition. However, studies have challenged the reliability and effectiveness of this measure.

Objective To test the hypothesis that the risk of VAP is not increased when residual gastric volume is not monitored compared with routine residual gastric volume monitoring in patients receiving invasive mechanical ventilation and early enteral nutrition.

Design, Setting, and Patients Randomized, noninferiority, open-label, multicenter trial conducted from May 2010 through March 2011 in adults requiring invasive mechanical ventilation for more than 2 days and given enteral nutrition within 36 hours after intubation at 9 French intensive care units (ICUs); 452 patients were randomized and 449 included in the intention-to-treat analysis (3 withdrew initial consent).

Intervention Absence of residual gastric volume monitoring. Intolerance to enteral nutrition was based only on regurgitation and vomiting in the intervention group and based on residual gastric volume greater than 250 mL at any of the 6 hourly measurements and regurgitation or vomiting in the control group.

Main Outcome Measures Proportion of patients with at least 1 VAP episode within 90 days after randomization, as assessed by an adjudication committee blinded to patient group. The prestated noninferiority margin was 10%.

Results In the intention-to-treat population, VAP occurred in 38 of 227 patients (16.7%) in the intervention group and in 35 of 222 patients (15.8%) in the control group (difference, 0.9%; 90% CI, −4.8% to 6.7%). There were no significant between-group differences in other ICU-acquired infections, mechanical ventilation duration, ICU stay length, or mortality rates. The proportion of patients receiving 100% of their calorie goal was higher in the intervention group (odds ratio, 1.77; 90% CI, 1.25-2.51; $P = .008$). Similar results were obtained in the per-protocol population.

Conclusion and Relevance Among adults requiring mechanical ventilation and receiving early enteral nutrition, the absence of gastric volume monitoring was not inferior to routine residual gastric volume monitoring in terms of development of VAP.

Trial Registration clinicaltrials.gov Identifier: NCT01113748

JAMA. 2013;309(3):249-256 www.jama.com

early enteral nutrition. When the residual gastric volume exceeds a predetermined cutoff, gastric prokinetic drugs are given and enteral nutrition is decreased or stopped to minimize the risk of aspiration and subsequent VAP.[13,14]

Author Affiliations and a List of the CRICS Group appear at the end of the article.

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Caring for the Critically Ill Patient Section Editor: Derek C. Angus, MD, MPH, Contributing Editor, JAMA (angusdc@upmc.edu).

For editorial comment see p 283.

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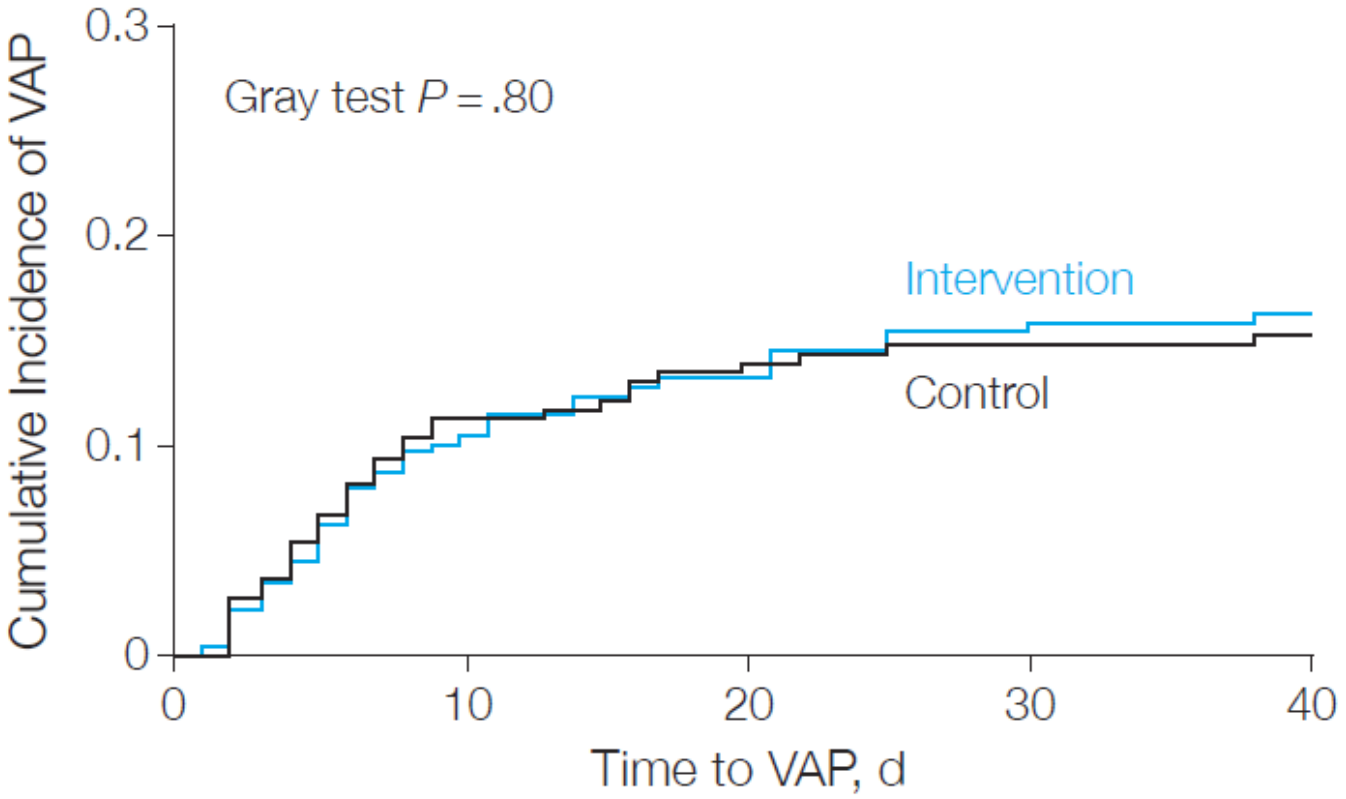
JAMA, January 16, 2013—Vol 309, No. 3 249

- 随机，非劣性，开放，多中心研究
- 预期>48h机械通气，插管后36h内鼻胃管喂养
- 干预组（227例），对照组（222例）
- 干预组EN不耐受定义为呕吐
- 对照组EN不耐受定义为呕吐
- 或GRV>250ml，or both
- 主要终点：90天内VAP

JAMA. 2013;309(3):249-256

北京天坛医院
Beijing Tiantan Hospital

NUTRIREA1:累积VAP发生率没有显著性差异



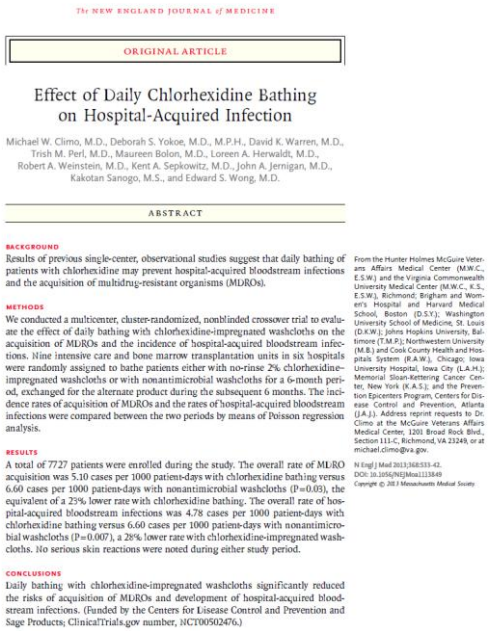
JAMA. 2013;309(3):249-256

NUTRIREA1:不监测GRV组摄入更多热卡，其他无差别

	Intervention (n = 227)	Control (n = 222)	% or Median Difference (90% CI)
Cumulative calorie deficit from day 0 to day 7, median (IQR), kcal[c]	319 (93-1012)	509 (185-1252)	−111 (−198 to −36)[d]
ICU-acquired infection, No. (%)[e]	60 (26.4)	60 (27.0)	−0.6 (−7.5 to 6.3)[a]
Duration of mechanical ventilation, median (IQR), d	7 (4-13)	7 (5-13)	0 (−1 to 0)[d]
ICU length of stay, median (IQR), d	10 (6-17)	10 (7-17)	−1 (−2 to 0)[d]
Mortality			
Day 28, No. (%)	63 (27.8)	61 (27.5)	0.3 (−6.7 to 7.2)[a]
Day 90, No. (%)	82 (36.3)	76 (34.2)	2.1 (−5.4 to 9.5)[a]

JAMA. 2013;309(3):249-256

氯已定擦浴与MDRO、医院获得性血行感染



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Effect of Daily Chlorhexidine Bathing on Hospital-Acquired Infection

Michael W. Climo, M.D., Deborah S. Yokoe, M.D., M.P.H., David K. Warren, M.D., Trish M. Perl, M.D., Maureen Bolon, M.D., Loreen A. Herwaldt, M.D., Robert A. Weinstein, M.D., Kent A. Sepkowitz, M.D., John A. Jernigan, M.D., Kakotan Sanogo, M.S., and Edward S. Wong, M.D.

ABSTRACT

BACKGROUND

Results of previous single-center, observational studies suggest that daily bathing of patients with chlorhexidine may prevent hospital-acquired bloodstream infections and the acquisition of multidrug-resistant organisms (MDROs).

METHODS

We conducted a multicenter, cluster-randomized, nonblinded crossover trial to evaluate the effect of daily bathing with chlorhexidine-impregnated washcloths on the acquisition of MDROs and the incidence of hospital-acquired bloodstream infections. Nine intensive care and bone marrow transplantation units in six hospitals were randomly assigned to bathe patients either with no-rinse 2% chlorhexidine–impregnated washcloths or with nonantimicrobial washcloths for a 6-month period, exchanged for the alternate product during the subsequent 6 months. The incidence rates of acquisition of MDROs and the rates of hospital-acquired bloodstream infections were compared between the two periods by means of Poisson regression analysis.

RESULTS

A total of 7727 patients were enrolled during the study. The overall rate of MDRO acquisition was 5.10 cases per 1000 patient-days with chlorhexidine bathing versus 6.60 cases per 1000 patient-days with nonantimicrobial washcloths (P=0.03), the equivalent of a 23% lower rate with chlorhexidine bathing. The overall rate of hospital-acquired bloodstream infections was 4.78 cases per 1000 patient-days with chlorhexidine bathing versus 6.60 cases per 1000 patient-days with nonantimicrobial washcloths (P=0.007), a 28% lower rate with chlorhexidine-impregnated washcloths. No serious skin reactions were noted during either study period.

CONCLUSIONS

Daily bathing with chlorhexidine-impregnated washcloths significantly reduced the risks of acquisition of MDROs and development of hospital-acquired bloodstream infections. (Funded by the Centers for Disease Control and Prevention and Sage Products; ClinicalTrials.gov number, NCT00502476.)

From the Hunter Holmes McGuire Veterans Affairs Medical Center (M.W.C., E.S.W.) and the Virginia Commonwealth University Medical Center (M.W.C., K.S., E.S.W.), Richmond; Brigham and Women's Hospital and Harvard Medical School, Boston (D.S.Y.); Washington University School of Medicine, St. Louis (D.K.W.); Johns Hopkins University, Baltimore (T.M.P.); Northwestern University (M.B.) and Cook County Health and Hospitals System (R.A.W.), Chicago; Iowa University Hospital, Iowa City (L.A.H.); Memorial Sloan-Kettering Cancer Center, New York (K.A.S.); and the Prevention Epicenters Program, Centers for Disease Control and Prevention, Atlanta (J.A.J.). Address reprint requests to Dr. Climo at the McGuire Veterans Affairs Medical Center, 1201 Broad Rock Blvd., Section 111-C, Richmond, VA 23249, or at michael.climo@va.gov.

N Engl J Med 2013;368:533-42.
DOI: 10.1056/NEJMoa1113849

- 多中心，簇随机，交叉性研究
- 6个ICU，3个骨髓移植单元，共9个单元
- 按单元进行随机，分为对照组和干预组
- 6个月时进行一次治疗转换
- 干预组，每天2%氯已定浸泡毛巾擦浴
- 终点：MDRO和血行感染发生率

N Engl J Med 2013;368:533-42.

氯已定擦浴降低MDRO和医院获得性血行感染的发生

Table 2. Incidence of Hospital-Acquired Bloodstream Infections and Acquisition of Multidrug Resistant Organisms (MDROs), MRSA, and VRE.*

Variable	Intervention Period	Control Period	P Value
MDRO acquisition			
No. of infections	127	165	0.03
Incidence rate (no./1000 patient-days)	5.10	6.60	
Hospital-acquired bloodstream infection			
No. of infections	119	165	0.007
Incidence rate (no./1000 patient-days)	4.78	6.60	
Primary bloodstream infection			
No. of infections	90	131	0.006
Incidence rate (no./1000 patient-days)	3.61	5.24	
Central-catheter–associated bloodstream infection			
No. of infections	21	43	0.004
Incidence rate (no./1000 catheter-days)	1.55	3.30	
Secondary bloodstream infection			
No. of infections	29	34	0.45
Incidence rate (no./1000 patient-days)	1.20	1.40	

N Engl J Med 2013;368:533-42.

SPIRIT-ICU：闭合性颅脑损伤聚维酮碘口腔护理预防VAP

Feature Articles

Effect of Oropharyngeal Povidone-Iodine Preventive Oral Care on Ventilator-Associated Pneumonia in Severely Brain-Injured or Cerebral Hemorrhage Patients: A Multicenter, Randomized Controlled Trial*

Philippe Seguin, MD, PhD[1,2,3]; Bruno Laviolle, MD, PhD[3,4,5]; Claire Dahyot-Fizelier, MD, PhD[6,7,8]; Romain Dumont, MD[9]; Benoit Veber, MD[10]; Soizic Gergaud, MD[11]; Karim Asehnoune, MD, PhD[5]; Olivier Mimoz, MD, PhD[6,7,8]; Pierre-Yves Donnio, PharmD[12,13]; Eric Bellissant, MD, PhD[3,4,5]; Yannick Malledant, MD[1,2,3]; for the Study of Povidone Iodine to Reduce Pulmonary Infection in Head Trauma and Cerebral Hemorrhage Patients (SPIRIT) ICU Study and AtlanRéa Groups

*See also p. 188.

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Drs. Seguin and Laviolle contributed equally to this study.

Currently listed as ClinicalTrials.gov (NCT00950027).
This work was done in the Département d'Anesthésie Réanimation, Centre Hospitalier Universitaire, Rennes, France; Département d'Anesthésie Réanimation, Centre Hospitalier Universitaire, Poitiers, France; Département d'Anesthésie Réanimation, Centre Hospitalier Universitaire, Nantes, France; Département d'Anesthésie Réanimation, Centre Hospitalier Universitaire, Rouen, France; Département d'Anesthésie Réanimation, Centre Hospitalier Universitaire, Angers, France.
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Dr. Veber is a board member for Lilly and lectured for Baxter. He received support for travel from Pfizer. Dr. Asehnoune lectured for B-Braun, Fresenius, and Baxter. Dr. Mimoz has received lecture and consultant fees from CareFusion, 3M Company, and Ethicon. The remaining authors have disclosed that they do not have any potential conflicts of interest.

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Objective: To evaluate the efficacy and safety of oral care with povidone-iodine on the occurrence of ventilator-associated pneumonia in a high-risk population.
Design: A multicenter, placebo-controlled, randomized, double-blind, two-parallel-group trial performed between May 2008 and May 2011.
Setting: Six ICUs in France.
Patients: One hundred seventy-nine severely brain-injured patients (Glasgow Coma Scale ≤ 8) or cerebral hemorrhage expected to be mechanically ventilated for more than 24 hours.
Interventions: Participants were randomly assigned to receive oropharyngeal care with povidone-iodine (n = 91) or placebo (n = 88) six times daily until mechanical ventilation withdrawal.
Measurements and Main Results: Primary endpoint was the rate of ventilator-associated pneumonia. Secondary endpoint included the rates of ventilator-associated tracheobronchitis and acute respiratory distress syndrome and patient's outcome. The number of patients evaluable for the primary endpoint (preplanned modified intention-to-treat population) was 150 (78 in the povidone-iodine group, 72 in the placebo group). Ventilator-associated pneumonia occurred in 24 patients (31%) in the povidone-iodine group and 20 (28%) in the placebo group (relative risk, 1.11

- 多中心，随机，安慰剂对照双盲研究
- 闭合性颅脑损伤，GCS≤8
- 机械通气预期≥48h
- 随机分组，聚维酮碘组（91例）
- 安慰剂组（88例）
- 口腔护理q4h
- 主要终点：VAP发生率

Crit Care Med 2014; 42:1–8

北京天坛医院
Beijing Tiantan Hospital

闭合性颅脑损伤聚维酮碘口护不能预防VAP，反而增加ARDS风险

Variables	Povidone-Iodine(n=78)	Placebo(n=72)	P
Occurrence of VAP, n (%)	24 (31)	20 (28)	0.69
Occurrence of ventilator-associated tracheobronchitis, n (%)	8 (10)	5 (7)	0.47
Occurrence of ARDS, n (%)	5 (6)	0 (0)	0.06
Length of stay, mean (SD), d			
In ICU	15 (13)	16 (14)	0.82
In hospital	20 (17)	22 (19)	0.35
Mortality, n (%)			
In ICU	28 (33)	21 (26)	0.30
At day 90	28 (33)	22 (27)	0.39

Crit Care Med 2014; 42:1–8

BUGG:ICU戴手套穿隔离衣与耐药菌

Research

Original Investigation

Universal Glove and Gown Use and Acquisition of Antibiotic-Resistant Bacteria in the ICU

A Randomized Trial

- 多中心，簇随机研究。共20个内科和外科ICU
- 按ICU随机，分为干预ICU和非干预ICU
- 干预ICU指接触所有患者以及进入任何患者房间时都戴手套穿隔离衣
- 非干预ICU指接触已知感染或定植耐药菌比如VRE和MRSA的患者或进入这些患者的房间时，戴手套穿隔离衣（CDC要求）
- 主要终点：出入ICU时监测性培养发现获得MRSA或VRE

JAMA. 2013;310(15):1571-1580.

北京天坛医院
Beijing Tiantan Hospital

BUGG:戴手套穿隔离衣未降低MRSA或VRE获得的机会

Table 2. Rates at Risk of Acquisition of Antibiotic-Resistant Bacteria per 1000 Patient-Days

	Intensive Care Units							
	Intervention			Control				
	No. of Acquisitions	Patient-Days at Risk	Mean Rate (95% CI)[a]	No. of Acquisitions	Patient-Days at Risk	Mean Rate (95% CI)[a]	Difference (95% CI)[b]	*P* Value[c]
Drug-Resistant Bacteria								
VRE or MRSA								
Study period	577	32 693.0	16.91 (14.09 to 20.28)	517	31 765.0	16.29 (13.48 to 19.68)		
Baseline	178	8684.0	21.35 (17.57 to 25.94)	176	9804.5	19.02 (14.20 to 25.49)		
Change[d]			−4.47 (−9.34 to 0.45)			−2.74 (−6.98 to 1.51)	−1.71 (−6.15 to 2.73)	.57
VRE								
Study period	411	27 765.5	13.59 (10.26 to 17.99)	337	28 340.5	11.88 (8.65 to 16.33)		
Baseline	108	7691.5	15.18 (10.50 to 21.95)	122	8818.0	14.37 (10.31 to 20.02)		
Change[d]			−1.60 (−7.18 to 3.98)			−2.48 (−5.53 to 0.56)	0.89 (−4.27 to 6.04)	.70
MRSA								
Study period	199	30 454.5	6.00 (4.63 to 7.78)	191	30 024.0	5.94 (4.59 to 7.67)		
Baseline	77	7841.0	10.03 (8.05 to 12.50)	59	9182.0	6.98 (4.50 to 10.83)		
Change[d]			−4.03 (−6.50 to −1.56)			−1.04 (−3.37 to 1.28)	−2.98 (−5.58 to −0.38)	.046

JAMA. 2013;310(15):1571-1580.

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BUGG:戴手套穿隔离衣减少医务者探视患者机会，增加手卫生顺应性

Table 3. Average Hand-Hygiene Compliance and Health Care Worker Visits per Hour

	Intensive Care Units			
	Intervention Mean (95% CI), %[b]	Control Mean (95% CI), %[b]	Control Mean (95% CI), %[b]	*P* Value[d]
Hand-hygiene compliance, %				
Room entry	56.1 (47.2 to 66.7)	50.2 (41.4 to 60.9)	5.91 (−6.91 to 18.7)	.42
Room exit	78.3 (72.1 to 85.0)	62.9 (54.4 to 72.8)	15.4 (8.99 to 21.8)	.02
Health care-worker visits	4.28 (3.95 to 4.64)	5.24 (4.46 to 6.16)[e]	−0.96 (−1.71 to −0.21)	.02

JAMA. 2013;310(15):1571-1580.

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MDR的传播方式

Feature Articles

Transfer of multidrug-resistant bacteria to healthcare workers' gloves and gowns after patient contact increases with environmental contamination*

Daniel J. Morgan, MD; Elizabeth Rogawski, BS; Kerri A. Thom, MD, MS; J. Kristie Johnson, PhD; Eli N. Perencevich, MD, MS; Michelle Shardell, PhD; Surbhi Leekha, MD, MPH; Anthony D. Harris, MD, MPH

Objective: To assess the role of environmental contamination in the transmission of multidrug-resistant bacteria to healthcare workers' clothing.

Design: Prospective cohort.

Setting: Six intensive care units at a tertiary care hospital.

Subjects: Healthcare workers including registered nurses, patient care technicians, respiratory therapists, occupational/physical therapists, and physicians.

Interventions: None.

Measurements and Main Results: One hundred twenty of 585 (20.5%) healthcare worker/patient interactions resulted in contamination of healthcare workers' gloves or gowns. Multidrug-resistant *Acinetobacter baumannii* contamination occurred most frequently, 55 of 167 observations (32.9%; 95% confidence interval [CI] 25.8% to 40.0%), followed by multidrug-resistant *Pseudomonas aeruginosa*, 15 of 86 (17.4%; 95% CI 9.4% to 25.4%), vancomycin-resistant *Enterococcus*, 25 of 180 (13.9%, 95% CI 8.9, 18.9%) and methicillin-resistant *Staphylococcus aureus*, 21 of 152 (13.8%; 95% CI 8.3% to 19.2%). Independent risk factors associated with healthcare worker contamination with multidrug-resistant bacteria were positive environmental cultures (odds ratio [OR] 4.2; 95% CI 2.7–6.5), duration in room for >5 mins (OR 2.0; 95% CI 1.2–3.4), performing physical examinations (OR 1.7; 95% CI 1.1–2.8), and contact with the ventilator (OR 1.8; 95% CI, 1.1–2.8). Pulsed field gel electrophoresis determined that 91% of healthcare worker isolates were related to an environmental or patient isolate.

Conclusions: The contamination of healthcare workers' protective clothing during routine care of patients with multidrug-resistant organisms is most frequent with *A. baumannii*. Environmental contamination was the major determinant of transmission to healthcare workers' gloves or gowns. Compliance with contact precautions and more aggressive environmental cleaning may decrease transmission. (Crit Care Med 2012; 40:1045–1051)

Key Words: *Acinetobacter*; contact precautions; contamination; environment; MRSA; VRE

Hospital-associated infections are estimated to contribute to the death of approximately 100,000 people per year in the United States (1). Multidrug-resistant (MDR) bacteria cause a significant proportion of hospital-associated infections (2–4). MDR bacteria are a significant problem worldwide with a high frequency of MDR bacteria in intensive care units (ICUs) from South America, Africa, Asia, and Europe (5–7). MDR *Acinetobacter baumannii* has emerged as epidemic in many countries (8). MDR bacteria are generally transmitted from patient-to-patient in the healthcare system by transiently contaminated healthcare workers, equipment, and the environment (9).

In multiple smaller studies, looking at one or two organisms, different activities have been associated with a greater likelihood of healthcare worker (HCW) clothing contamination including contact with wound dressing, artificial airways, side rails, linens, infusion pumps, catheters or drain, and direct patient contact including performing a physical examination or spending a longer duration in a room (4, 10, 11). Studies have not assessed common risk factors for contamination with the most common MDR bacteria and have been limited by clustering of patients or repeated measurements of the same HCW. *A. baumannii* may be more likely than other MDR bacteria to contaminate HCW clothing or the environment, although it has not been directly compared to methicillin-resistant *Staphylococcus aureus* (MRSA) or vancomycin-resistant *Enterococci* (4). Understanding factors that lead to contamination of HCW clothing, and thus increase potential for transmission, may help lead to interventions to prevent transmission of MDR bacteria. To our knowledge, no study has assessed the importance of environmental contamination leading to contamination of HCW clothing and thus the potential causal role of the environment inpatient-to-patient transmission of MDR bacteria.

To evaluate the differential rate of contamination by MDR *A. baumannii* compared with other MDR bacteria as well as investigating the importance of environmental contamination in the transfer of MDR bacteria to HCW clothing, we studied a cohort of ICU-based HCWs performing routine patient care.

METHODS

A cohort study was conducted at the 662-bed University of Maryland Medical Center

*See also p. 1333.

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- 前瞻性队列研究
- 马里兰大学医学中心6个ICU
- 研究对象：医护人员
- 观察指标：不同细菌污染频率
- 以及污染的危险因素

Crit Care Med 2012; 40:1045–1051

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不动杆菌最易污染，危险因素主要为环境污染

接触MDRO感染患者后，医务人员隔离衣和手套污染率

Multidrug-Resistant Bacteria	Hands Contaminated Before Room Entry[a]	Gowns or Gloves (95% confidence intervals)
Methicillin-resistant *Staphylococcus aureus* (23 patients)	3.2% (5/157)	13.8% (8.3% to 19.2%)
Vancomycin-resistant *Enterococci* (27 patients)	0.6% (1/181)	13.9% (8.9% to 18.9%)
Multidrug-resistant *Pseudomonas aeruginosa* (13 patients)	3.4% (3/89)	17.4% (9.4% to 25.4%)
Multidrug-resistant *Acinetobacter baumannii* (26 patients)	5.1% (9/176)	32.9% (25.8% to 40.0%)

Crit Care Med 2012; 40:1045–1051

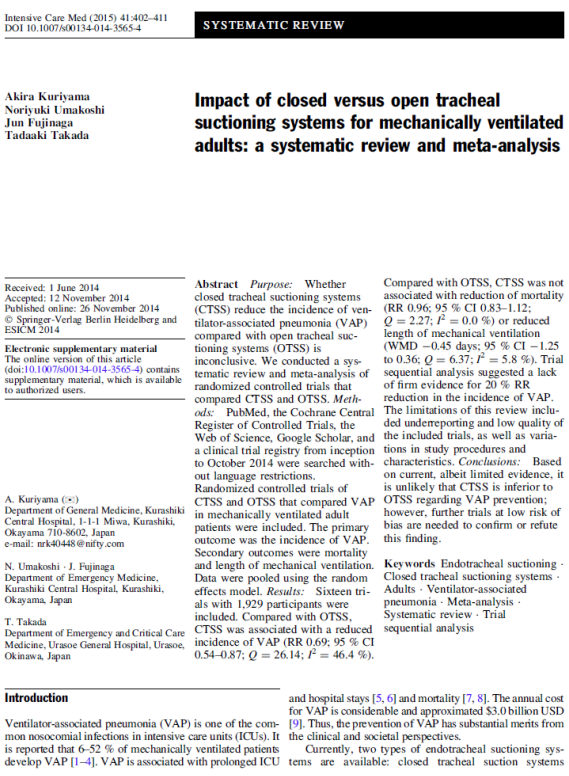
不动杆菌最易污染，危险因素主要为环境污染

MDRO污染医护人员的独立危险因素

Independent Variable	Odds Ratio (95% Confidence Interval)[a]	p^a
Positive multidrug-resistant bacteria environmental culture	4.15 (2.66–6.47)	<.001
Duration in room >5 mins	1.99 (1.15–3.43)	.014
Performing physical examination	1.74 (1.10–2.77)	.019
Contact with ventilator	1.78 (1.12–2.82)	.014

Crit Care Med 2012; 40:1045–1051

META:密闭气管内吸痰系统 vs. 开放气管内吸痰系统



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SYSTEMATIC REVIEW

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Noriyuki Umakoshi
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Tadaaki Takada

Impact of closed versus open tracheal suctioning systems for mechanically ventilated adults: a systematic review and meta-analysis

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Abstract *Purpose:* Whether closed tracheal suctioning systems (CTSS) reduce the incidence of ventilator-associated pneumonia (VAP) compared with open tracheal suctioning systems (OTSS) is inconclusive. We conducted a systematic review and meta-analysis of randomized controlled trials that compared CTSS and OTSS. *Methods:* PubMed, the Cochrane Central Register of Controlled Trials, the Web of Science, Google Scholar, and a clinical trial registry from inception to October 2014 were searched without language restrictions. Randomized controlled trials of CTSS and OTSS that compared VAP in mechanically ventilated adult patients were included. The primary outcome was the incidence of VAP. Secondary outcomes were mortality and length of mechanical ventilation. Data were pooled using the random effects model. *Results:* Sixteen trials with 1,929 participants were included. Compared with OTSS, CTSS was associated with a reduced incidence of VAP (RR 0.69; 95 % CI 0.54–0.87; $Q = 26.14$; $I^2 = 46.4$ %). Compared with OTSS, CTSS was not associated with reduction of mortality (RR 0.96; 95 % CI 0.83–1.12; $Q = 2.27$; $I^2 = 0.0$ %) or reduced length of mechanical ventilation (WMD −0.45 days; 95 % CI −1.25 to 0.36; $Q = 6.37$; $I^2 = 5.8$ %). Trial sequential analysis suggested a lack of firm evidence for 20 % RR reduction in the incidence of VAP. The limitations of this review included underreporting and low quality of the included trials, as well as variations in study procedures and characteristics. *Conclusions:* Based on current, albeit limited evidence, it is unlikely that CTSS is inferior to OTSS regarding VAP prevention; however, further trials at low risk of bias are needed to confirm or refute this finding.

Keywords Endotracheal suctioning · Closed tracheal suctioning systems · Adults · Ventilator-associated pneumonia · Meta-analysis · Systematic review · Trial sequential analysis

Introduction

Ventilator-associated pneumonia (VAP) is one of the common nosocomial infections in intensive care units (ICUs). It is reported that 6–52 % of mechanically ventilated patients develop VAP [1–4]. VAP is associated with prolonged ICU and hospital stays [5, 6] and mortality [7, 8]. The annual cost for VAP is considerable and approximated $3.0 billion USD [9]. Thus, the prevention of VAP has substantial merits from the clinical and societal perspectives.

Currently, two types of endotracheal suctioning systems are available: closed tracheal suction systems

- 纳入16个RCT研究
- 对比CTSS和OTSS
- 研究对象为机械通气患者
- 16个RCT研究共1929例患者
- 终点：VAP，死亡率，机械通气时间

Intensive Care Med 2015; 41:402–411

北京天坛医院
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META：CTSS降低VAP发生率，不能降低死亡率或机械通气的时间

Outcome	Population	Summary estimate (95 % CI)
VAP	Overall	0.69 (0.54 to 0.88)
	Mixed ICU	0.63 (0.40 to 0.99)
	Medical ICU	0.79 (0.42 to 1.47)
	Surgical ICU	0.82 (0.53 to 1.25)
	Uncertain	0.56 (0.40 to 0.79)
Mortality	Overall	0.96 (0.83 to 1.12)
	Mixed ICU	1.06 (0.83 to 1.37)
	Medical ICU	0.91 (0.75 to 1.12)
	Surgical ICU	0.91 (0.57 to 1.46)
Length of mechanical ventilation	Overall	−0.45 (−1.25 to 0.36)
	Mixed ICU	−0.55 (−1.68 to 0.58)
	Medical ICU	−0.37 (−2.49 to 1.75)

Intensive Care Med 2015; 41:402–411

心肺复苏的持续时间

Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study

Zachary D Goldberger, Paul S Chan, Robert A Berg, Steven L Kronick, Colin R Cooke, Mingrui Lu, Mousumi Banerjee, Rodney A Hayward, Harlan M Krumholz, Brahmajee K Nallamothu, for the American Heart Association Get With The Guidelines—Resuscitation (formerly the National Registry of Cardiopulmonary Resuscitation) Investigators*

Summary

Background During in-hospital cardiac arrests, how long resuscitation attempts should be continued before termination of efforts is unknown. We investigated whether duration of resuscitation attempts varies between hospitals and whether patients at hospitals that attempt resuscitation for longer have higher survival rates than do those at hospitals with shorter durations of resuscitation efforts.

Methods Between 2000 and 2008, we identified 64 339 patients with cardiac arrests at 435 US hospitals within the Get With The Guidelines—Resuscitation registry. For each hospital, we calculated the median duration of resuscitation before termination of efforts in non-survivors as a measure of the hospital's overall tendency for longer attempts. We used multilevel regression models to assess the association between the length of resuscitation attempts and risk-adjusted survival. Our primary endpoints were immediate survival with return of spontaneous circulation during cardiac arrest and survival to hospital discharge.

Findings 31 198 of 64 339 (48·5%) patients achieved return of spontaneous circulation and 9912 (15·4%) survived to discharge. For patients achieving return of spontaneous circulation, the median duration of resuscitation was 12 min (IQR 6–21) compared with 20 min (14–30) for non-survivors. Compared with patients at hospitals in the quartile with the shortest median resuscitation attempts in non-survivors (16 min [IQR 15–17]), those at hospitals in the quartile with the longest attempts (25 min [25–28]) had a higher likelihood of return of spontaneous circulation (adjusted risk ratio 1·12, 95% CI 1·06–1·18; p<0·0001) and survival to discharge (1·12, 1·02–1·23; 0·021).

Interpretation Duration of resuscitation attempts varies between hospitals. Although we cannot define an optimum duration for resuscitation attempts on the basis of these observational data, our findings suggest that efforts to systematically increase the duration of resuscitation could improve survival in this high-risk population.

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Introduction

Between one and five of every 1000 hospital inpatients in developed countries are estimated to have a cardiac arrest, and less than 20% of such patients survive to discharge.[1,2] One of the biggest challenges facing clinicians is the decision about when to stop resuscitation efforts in patients who arrest. Clinicians are frequently reluctant to continue efforts when return of spontaneous circulation does not occur shortly after initiation of resuscitation, in view of the overall poor prognosis for such patients.[3] Furthermore, little empirical evidence is available to guide clinicians about the appropriate length of resuscitation attempts before termination of efforts. Thus, guidelines have not directly addressed this issue,[4,5] and clinicians rely largely on case series and expert opinion to guide their practice.[6–9] Although this strategy has probably led to substantial differences between hospitals in the duration of resuscitation attempts in non-survivors, little is known about the extent of such variation in routine practice and the potential relation with survival.

We assessed patterns of duration of resuscitation attempts and risk-adjusted survival at US hospitals. We focused on non-survivors to estimate each hospital's overall tendency for practising long attempts before termination of efforts. We then postulated that the duration of resuscitation in non-survivors would vary substantially between hospitals and that patients at hospitals in which the duration of resuscitation attempts was longer would have a higher likelihood of return of spontaneous circulation and survival to discharge than would those at hospitals with shorter resuscitation attempts.

Methods

Data source

Get With The Guidelines—Resuscitation (previously known as the National Registry of Cardiopulmonary Resuscitation) is a large, multicentre observational registry of in-hospital cardiac arrests that previous investigators[10,11] have described in detail. Briefly, trained research personnel at participating hospitals prospectively collect information about consecutive patients with in-hospital cardiac arrests, which are defined by unresponsiveness, apnoea, and the absence of a central palpable pulse. Cases

- 观察性研究，从2000-2008年
- 435家美国医院，共64339例患者
- 评价复苏时间与生存的关系
- 生存：自主循环恢复后即生存
- 或出院时生存

Lancet 2012; 380: 1473–81

心肺复苏持续时间越长恢复自主循环的比例越高

Quartile 1（复苏时间最短，16min），Quartile 4（复苏时间最长，25min）

	Return of spontaneous circulation*			Survival to discharge†		
	Adjusted risk ratio (95% CI)	Adjusted rate	p value	Adjusted risk ratio (95% CI)	Adjusted rate	p value
Quartile 1 (13 994 patients at 113 hospitals)	1·00	45·3%	..	1·00	14·5%	..
Quartile 2 (18 783 patients at 121 hospitals)	1·04 (0·99–1·09)	47·0%	0·116	1·05 (0·96–1·14)	15·2%	0·304
Quartile 3 (19 106 patients at 107 hospitals)	1·08 (1·03–1·13)	48·8%	0·002	1·05 (0·96–1·14)	15·2%	0·280
Quartile 4 (12 456 patients at 94 hospitals)	1·12 (1·06–1·18)	50·7%	<0·0001	1·12 (1·02–1·23)	16·2%	0·021

*p for trend <0·0001. †p for trend 0·031.

Table 3: Return of spontaneous circulation and survival to discharge in all patients, by hospital quartile

Lancet 2012; 380: 1473–81

谢谢