

急症医疗机构预防中心导管相关血流感染的策略 2014更新版

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目的:

既往发表的指南已经为发现和预防医疗相关感染(Healthcare associated infections, HAIs)提供了全面的建议。本文将以前者的形式, 强调实用性建议, 帮助急症医疗机构(acute-care hospital)落实和优化预防中心导管相关血流感染(central line associated bloodstream infections, CLABSIs)的工作。本指南是对2008年《急症医疗机构中心导管相关血流感染预防策略》的更新¹。这份专业性指导文件由美国医院流行病学学会(Society of Healthcare Epidemiology of America, SHEA)发起, 由美国医院流行病学学会(SHEA)、美国感染性疾病学会(Infectious Disease Society of America, IDSA)、美国医院协会(The American Hospital Association, AHA)、美国感染控制和流行病学专业学会(Association for Professionals in Infection Control and Epidemiology, APIC)和联合委员会(The Joint Commission)合作完成, 其中主要贡献来自一些专业组织和学会代表以及专家意见。对本指南认可和组织的组织见2014更新版的介绍。²

第一部分: 基本原理和严重性

I. 急症医疗医疗机构病人患 CLABSIs 的风险

- A. 重症监护病房(Intensive Care Unit, ICU)人群: ICU病人患中心导管相关血流感染(CLABSIs)的风险很高, 其原因包括频繁置入多个导管, 使用那些一般只在ICU放置的、有潜在危险的特殊类型导管(如带有传感器的肺动脉导管(pulmonary artery catheters with catheter introducers), 以及一些不争的事实, 如导管常常是在急救时紧急置入, 导管需每天反复插入和长期使用。^{3,4}
- B. 非ICU人群: 在过去的20年中尽管主要关注了ICU环境, 但医院里大部分CLABSIs发生在ICU外或门诊患者。⁵⁻¹⁰
- C. 预防与控制感染还应包括其他易感人群, 如通过导管进行血透患者¹¹、术中患者¹²和肿瘤患者。
- D. 除中心静脉导管(CVCs)外, 外周动脉导管也会带来感染风险。³

II. 医院获得性 CLABSI 的相关结果

- A. 增加住院天数。¹³⁻¹⁷

- B. 增加医疗费用（经非通胀调整后，每例 CLABSI 可导致从 3700 到 39000 美元不等的额外花费^{14,17-19}）。

III. CLABSI 的独立风险因素（至少 2 项已发表的研究）²⁰⁻²⁵

- A. 增加风险的相关因素：
1. 插管前有较长的住院天数
 2. 较长的带管天数
 3. 插管部位有大量的细菌定植
 4. 导管接口有大量的细菌定植
 5. 颈内静脉插管
 6. 成人股静脉插管
 7. 中性粒细胞减少
 8. 早产（即胎龄过早）
 9. ICU 内护患比减少^{26,27}
 10. 全肠道外营养
 11. 不标准的导管护理（如导管过多操作）
 12. 输血或血液制品（儿童中）
- B. 减少风险的相关因素：
1. 女性
 2. 抗生素管理^{22,28}
 3. 含米诺环素-利福平的导管^{29,30}

第二部分：背景——发现 CLABSI 的策略

I. 监测手册和 CLABSI 定义

- A. 使用统一的监测方法和监测定义，便于与基准数据比对。
- B. 参考《国家医疗安全网 (NHSN) 手册：患者安全内容》中有关的监测方法，包括血标本采集信息和 CLABSI 监测定义。手册中相关的章节是“在 NHSN 中发现医院感染 (HAI)”、“医疗仪器相关模块：方法学”和“医疗仪器相关模块：导管相关血流感染事件”。
- ³¹
1. 近期数据表明，使用 NHSN 定义的机构间可信度低于预期值。³²⁻³⁴ 这可能

会影响公众报告的可信度。另外，NHSN CLABSI 的监测定义与导管相关血流感染的临床定义也不相同。³⁵

第三部分：背景——预防 CLABSI 的策略

I. 现有指南和建议：

- A. 若干政府部门、公共卫生和专业组织已经发布针对 CLABSI 预防的循证指南和/或实施指导帮助，这些组织机构包括：
1. 美国疾病控制预防中心 (CDC) 医院感染控制措施咨询委员会 (The Healthcare Infection Control Practices Advisory Committee, HICPAC)^{36,37}
 2. 医疗保健质量改进机构 (The Institute for Healthcare Improvement, IHI)³⁸
 3. 医疗保健研究和质量机构 (The Agency for Healthcare Research and Quality, AHRQ)³⁹
 4. 美国儿科协会和临床试验委员会 (The American Pediatric Surgical Association Outcomes and Clinical Trials Committee)⁴⁰
 5. 联合委员会 (The Joint Commission)⁴¹
 6. APIC⁴²
 7. 输液护士协会 (The Infusion Nurses Society)⁴³
- B. 除非另有说明，本文中的建议主要是针对中心静脉导管 (Central Venous Catheters, CVCs)，这些建议：
1. 不根据导管类型分类（例如：经隧道、植入、套囊、无套囊导管、血透导管），并且，
 2. 可能不适用于预防其他血管植入设备所致的血液感染。
- ### II. 基本配置包括如下：
- A. 有足够的感染预防和控制项目工作人

员，他们负责发现符合 CLABSI 监测定义的患者。

- B. 有信息技术可以收集用于计算 CLABSI 感染率的导管日和计算导管使用率的病人天数。从信息系统得来的导管日需要与人工采集的导管日比较，其中的误差应在±5%左右。
- C. 有能提供合适教育和培训的资源。
- D. 有充分的实验室支持，能及时处理标本并报告结果。

第四部分：预防 CLABSI 的建议策略

建议分为（1）所有医疗机构均可采用的基本措施，和（2）特殊措施。特殊措施主要适用于那些使用基本措施后，CLABSI 仍无法得到有效控制的特殊科室或人群。基本措施中的建议对降低 CLABSI 风险的影响显著高于不良结果。而特殊措施中的建议虽然可能会降低 CLABSI 的风险，但同时也要考虑不良结果，而且这些建议的证据质量低，或证据仅支持在特定环境下（如暴发期间）或是特定病人群体中的干预效果。医院可以理清优先顺序，首先将精力放在基本措施中的预防方法。如果 CLABSI 监测和其他风险评估提示有进一步提高和改进的机会，医院应考虑或采取特殊措施中的某些或全部预防方法。这些特殊预防方法和措施可以用于特殊场所和/或特殊患者群，也可以用于全院，这取决于结果（outcome）数据、风险评估和/或当地要求。每一种感染预防建议都有证据质量分级。（见表 1）

值得一提的是，以下措施已经整合到侧重于插管的“预防组合”（prevention bundle）中（如措施 B2, B3, B6, B7, C3）。⁴⁴⁻⁴⁶大量研究已经证明，无论在成人还是儿童中使用这种组合措施既有效又具有可持续性，并且还有成本效益。⁴⁷⁻⁵⁰如果医院已经建立病人安全文化，实施这样的组合措施最有可能成功，当然成功也取决于措施的依从性。⁵¹但最近的数据显示，要有效控制 CLABSI，并不需要组合措

施中所有内容。⁵²在导管插入后，建议使用护理组合确保最佳导管护理。⁵³目前仍需要更多的数据确定护理组合中确实能降低危险的基本措施。^{54,55}

I. 预防和监测 CLABSI 的基本措施：向所有急症医疗机构的建议

A. 插管前

1. 为能轻松取用循证 CVC 指征列表提供方便，以减少不必要的 CVC 放置（证据质量 III）。
2. 对涉及插管、护理和维护 CVC 导管的医务人员进行预防 CLABSI 相关知识的教育培训。（证据质量 II）⁵⁶⁻⁶⁰
 - a. 教育培训的内容包括插管指征、正确插管和维护，以及 CLABSI 的风险和一般感染预防策略。
 - b. 确保所有涉及插管及护理的医疗人员，在执行这些任务前都完成了预防 CLABSI 基本措施的培训。^{61,62}定期进行带有能力评估的复训颇有裨益。⁶³
 - c. 确保任何医疗人员独立进行 CVC 插管前，有一个 CVC 插管资质认定过程（由各个医疗机构建立）以确保他们有能力胜任。
 - d. 当机构更改输注系统的内容、操作时，需要重新开展培训（如医疗机构启用无针连接系统时，需要改变护理操作）。
 - e. 考虑对正确插管技术进行模拟培训。⁶⁴⁻⁶⁶
3. 2月龄以上的 ICU 病人每天使用氯己定沐浴（证据质量 I）。⁷⁻⁷⁰
 - a. 在长期护理机构中，每天用氯己定沐浴可以看作是一项预防措施。⁷¹
 - b. 在非 ICU 病人中，氯己定沐浴的作用仍未确定。⁷²

c. 供 2 月龄以下儿童使用的消毒剂尚无最佳选择。但氯己定已经广泛用于 2 月龄以下的儿童。⁷³ 美国的一项调查中发现，大部分新生儿 ICU（NICUs）在插管时使用氯己定。⁷⁴ 对于以葡萄糖醛酸氯己定（chlorhexidine gluconate, CHG）为基础的局部消毒产品，FDA 建议“早产儿或 2 月龄以下儿童谨慎使用，这些产品可能会造成皮肤刺激或化学烧伤。”美国儿科外科学会推荐 CHG 的使用，但声明“在新生儿和早产儿中慎用，因为有增加刺激皮肤和全身吸收的风险。”⁴⁰ 在 2 月龄以下儿童使用的问题已被广泛关注。⁷⁵ 在出生不足 48 小时的极低体重新生儿对 CHG 有皮肤反应的情况已有报道。⁷⁶ 但一项小型研究中发现，对体重在 1000g 以下的、至少出生 7 天的新生儿，尽管表皮会吸收 CHG，但没有出现严重的接触性皮炎。⁷⁷ 最近一项对体重超过或等于 1500g 的婴儿研究中却没有发现同样的情况。^{78,79} 一些医院在机构已经在给这个年龄组的儿童插管时使用含氯己定的海绵敷料，并使用氯己定对 CVC 插管部位进行清洁，但极少产生上述反应风险。⁴⁰ 对于小于 2 个月的儿童，使用者必须在预防 CLABSI 潜在的得益与使用 CHG 可能带来的风险中仔细权衡，认识到足月产儿和早产儿可能会有不同的风险。另外其他药物，如吡咯烷碘（povidone-iodine）或乙醇（alcohol），也可以用于这个年龄段的儿童。⁸⁰

B. 插管中

1. 无论是在 ICU 或非 ICU 进行 CVC 插管，

都要有一个能保证感染预防和控制措施依从性的程序，如核查表（checklist）。（证据质量 II）^{45,81,82}

- a. 确保严格执行无菌技术并记录。
 - i. 建议使用核查表保证最佳插管操作。如果使用核查表，应由其他人而非插管者本人记录。
 - ii. 在进行 CVC 插管时，由护士、医生或其他接受过正确教育（见上）的医疗人员进行观察，确定保持无菌技术。
 - iii. 一旦观察到违反无菌技术的操作，这些工作人员有权中止操作。
2. 在插管或操作前进行手卫生。（证据质量 II）⁸³⁻⁸⁷
 - a. 使用乙醇为基础的无水产品或抗菌肥皂加水洗手法
 - i. 使用手套不能替代手卫生
3. 如果插管是事先计划好的可控情况下，应避免在肥胖病人中使用股静脉作为中心静脉通路。（证据质量 I）^{28,88-90}
 - a. 其他因素也会影响股静脉导管病人的 CLABSI 风险。^{91,92}
 - b. 在儿童病人中，股静脉导管可以在没有全麻情况下置管，在这组人群中没有发现股静脉导管增加感染的风险。⁹³
 - c. 对不同部位短期 CVC 通路的感染和非感染并发症仍存在争议。^{89,94} 不同插管部位的利弊必须考虑个人情况（例如：如果颈静脉通路病人同时有气管切开，则会有更高的感染风险⁹⁵）。
 - d. 不要使用外周 CVC 插管（PICC）作为减少 CLABSI 风险的策略。
 - i. ICU 内 PICC 病人的感染风险接近锁骨下或颈内静脉 CVC 的风险。^{96,97}

ii.大部分 PICC 造成的 CLABSI 发生在非 ICU。⁹⁸ PICC 相关的 CLABSI 风险可能与 ICU 外不同。

4. 使用包含穿刺置管所需全部物品的套装。(证据质量 II)⁴⁵
 - a. 所有具备插管能力的病房都应配备 CVC 插管包, 包内装有所有插管所需的物品, 并且取用方便。
5. 使用超声引导颈内静脉导管插管。(证据质量 □)⁹⁹
 - a. 超声引导颈内静脉插管能减少 CLABSI 风险以及放置 CVC 产生的非感染性并发症。¹⁰⁰
6. CVC 插管时使用最大限度无菌屏障作为预防手段。(证据质量 II)¹⁰¹⁻¹⁰⁷
 - a. 使用最大限度无菌屏障作为预防手段。
 - i. 涉及导管置管操作的所有医务人员都应该戴口罩、帽子, 穿无菌手术衣并戴无菌手套。
 - ii. 导管穿刺过程中, 病人覆盖大(全身)无菌铺巾。
 - b. 用导丝更换导管时也必须遵循这些措施。
 - c. 一项对外科病人的前瞻性随机研究显示最大无菌屏障没有额外的得益,¹⁰⁵ 但绝大部分可用证据显示这种干预措施确实能减少风险。
7. 使用乙醇-氯己定消毒剂进行皮肤消毒。(证据质量 I)¹⁰⁸⁻¹¹¹
 - a. 在插管之前, 使用含氯己定超过 0.5% 的乙醇-氯己定溶液对穿刺点进行皮肤消毒。¹¹²
 - i. 在进行皮肤穿刺之前应确保消毒液挥发、干燥。

C. 插管后

1. 确保适当的护士-患者比, 减少使用流动 ICU 护士。(证据质量 I)^{26,27,113,114}
 - a. 观察性研究显示在护士管理 CVC 病人

的 ICU 中, 护患比至少达到 1:2, 并且在 ICU 内工作的流动护士应限制在最少。

2. 接触导管前, 应消毒导管接口、无针连接系统和输液港。(证据质量 II)¹¹⁵⁻¹¹⁹
 - a. 在连接导管接口、无针连接系统和输液港之前, 使用乙醇-氯己定溶液、70% 乙醇或吡咯烷碘对上述部位进行有力的机械擦拭消毒。与乙醇相比, 乙醇-氯己定有更长的残留活性。¹²⁰
 - b. 使用机械擦拭至少 5 秒钟以减少污染。^{121, 122} 尚不清楚这种消毒时间能否普遍适用于无针连接系统, 现有这些研究没有对此进行检验。
 - c. 对接口/连接器/输液港消毒的依从性进行监视, 因为标准操作情况下, 这些导管部位中有一半存在细菌定植。^{117,121}
3. 拔除不必要的导管。(证据质量 II)^{123,124}
 - a. 在多科查房中, 每天评估保留血管内通路的必要性。拔除不需要的导管。
 - b. 对常规拔除达到预期使用目的 CVC 进行依从性审核可能有帮助。^{125,126} 简单和多方面结合干预能有效减少不必要的 CVC 导管使用。^{127,128}
4. 在成人和儿童中, 对无隧道 CVC 每 5~7 天更换透明敷料并使用含氯己定的消毒剂进行穿刺点护理, 如敷料有污染、松弛或潮湿时应立即更换; 纱布敷料每 2 天更换, 如敷料有污染、松弛或潮湿时更换频率更快。(证据质量 II)¹²⁹⁻¹³¹
 - a. NICU 特定病人可以通过减少敷料更换频率来减少导管移除的风险。
 - b. 如果导管部位有引流, 使用纱布敷料而非透明敷料直至引流管拔除。
5. 管理套装如非用于血液、血液制品或脂质, 更换间隔不超过 96 小时。(证据质量 II)

- a. 使用套装的最佳更换间隔时间目前尚未解决。
- 6. 对于血透导管穿刺部位使用抗生素软膏。(证据质量 I)¹³⁴⁻¹⁴⁰
 - a. 如果与导管材料相容的话,可以使用“三联”多链丝霉素(polysporin)(如能获得)或吡咯烷碘软膏对血透导管穿刺部位进行消毒。
 - i. 某些制造商已经声明含有乙二醇成分的软膏不能用于他们的聚氨酯导管。
 - b. 不要在导管穿刺部位使用莫匹罗星软膏,因为莫匹罗星有耐药风险并且对聚乙烯导管有潜在的损伤性。
- 7. 对 ICU 和非 ICU 进行 CLABSI 监测。(证据质量 I)^{6,7,141,142}
 - a. 测量特定病区的 CLABSI 发生率(每 1000 导管日 CLABSI 例数)并定期向病区、医生、护理领导者和监管病区医院管理者报告数据。
 - b. 对个别病区,CLABSI 发生率与历史数据和全国水平进行比较(比如 NHSN)。¹⁴³
 - c. 为减少不同观察者之间可信度的差别,必须进行审核监测。^{32,33}
 - d. ICU 外的 CLABSI 监测需要额外资源。¹⁴⁴ 电子监测系统适合这些场所。

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E. 预防 CLABSI 的特殊方法

许多特殊预防方法已经问世。在考虑采用这些方法中的任何一项之前,都应对 CLABSI 进行风险评估,把可能产生的不良事件和成本考虑其中。当 CLABSI 率高于机构或病区的阈值时,评估以技术为基础的干预措施效果是否合理,同时这也是一个检验实际操作的机会,可以考虑制定一些行为改变以减少 CLABSI 风险。这些特殊的方法建

议用于医院内 CLABSI 率极高的部门和/或患者人群。在这些部门和/或患者人群中,尽管已采用上述基础措施,但还不能把感染率降低到可以接受的水平。

- 1. 在成年病人中使用含消毒剂或抗生素的 CVC 导管。(证据质量 I)^{29,30,146,152}
 - a. 使用某些目前上市的含消毒剂导管(如氯己定-银磺胺嘧啶)和含抗生素导管(如米诺环素-利福平)的导管可以减少 CLABSI 风险。在下述情况下使用这类导管:
 - i. 尽管使用了 CLABSI 基本预防措施,但医疗机构内某些病区或病人群体的 CLABSI 率仍有高于医院目标。一些证据表明 CLABSI 导管感染发生率低的病区,使用抗菌导管并无特殊益处。¹⁵³
 - ii. 病人静脉通路有限,有复发 CLABSI 的病史。
 - iii. 病人如患 CLABSI,导致严重后遗症的风险增高。(如病人最近有血管内植入性设备,如心脏瓣膜假体或主动脉植入物)
 - b. 监测患者的不良反应,如过敏反应。¹⁵⁴
- 2. 在超过 2 月龄的病人身上使用含氯己定敷料护理 CVC。(证据质量 I)^{80,155-160}
 - a. 如果每天使用氯己定沐浴,再使用氯己定敷料是否有其他额外的受益尚不清楚,反之亦然。
- 3. 使用含消毒剂的连接口/连接帽/输液口保护器覆盖连接口。(证据质量 □)¹⁶¹⁻¹⁶⁵
- 4. 早产儿中可使用含银-沸石(zeolite-impregnated)的脐导管(在允许在儿童中使用该导管的国家)。(证据质量 II)¹⁶⁶
 - a. 观测研究表明,其他含抗生物的导管在儿科 ICU 病人中使用安全,更有发

展前景。¹⁶⁷⁻¹⁶⁹

5. 使用 CVC 抗生素封管 (antimicrobial lock) (证据质量 □)¹⁷⁰⁻¹⁷⁵

a. 抗生素封管是用超过治疗浓度的抗生素溶液充满管腔, 保留至导管接口再次使用。这种方法可以减少 CLABSI 风险。鉴于暴露的细菌会出现耐药可能, 仅在以下情况作为预防策略:

- i. 病人有长期血透导管。¹⁷⁶
- ii. 病人静脉通路有限, 有复发 CLABSI 病史。
- iii. 病人如患 CLABSI 会大大提高患严重后遗症的风险 (如病人近期有植入性血管内设备, 如假体心脏瓣膜或主动脉移植物)。

b. 为减少全身毒性, 在达到保留时间后应将抗生素液体吸出而非冲洗掉。¹⁷⁷⁻¹⁸⁰ 其他指南, 可参见 IDSA 的《血管内导管相关感染的诊断与治疗临床实践指南》。³⁵

6. 血透病人中通过 CVC 进行血透之后, 每周一次使用重组纤溶蛋白酶原活化因子。(证据质量 □)¹⁸¹

III.不能当作常规 CLABSI 预防的方法:

1. 对短期插管病人、有皮下隧道插管病人或带有导管的病人, 不要预防性使用预防性抗生素。(证据质量 □)¹⁸²⁻¹⁸⁶

a. 不推荐使用系统性预防性抗生素。

2. 不要常规更换中心静脉导管或动脉导管。(证据质量 □)¹⁸⁷⁻¹⁸⁹

a. 不推荐常规更换导管。

IV.尚未解决的问题

1. 在未进行风险与收益评估及开展正确使用方法的培训前, 常规使用无针连接系统作为预防 CLABSI 的策略。¹⁹⁰⁻¹⁹⁴

a. 尽管目前有多种设备可用, 但预防感染的最佳设计仍是一个尚未解决的问题。无针连接系统的最初目的是预防间歇使用时的针刺伤。尚无无针连接系统用于连续输液的数据。

2. 静脉治疗团队在降低 CLABSI 中的作用。^{77,195}

a. 研究显示静脉治疗团队负责外周静脉插管及维护能减少血流感染风险。¹⁹⁶ 但关于静脉治疗团队是否可以减少 CLABSI 感染率的研究很少。

3. 其它种类导管的监测 (如外周动脉导管或静脉导管)。^{3,4}

a. 尽管外周动脉导管 (peripheral arterial) 或外周静脉导管 (peripheral venous catheters) 有独立导致血流感染的风险, 绝大多数监测系统不包括这些导管,^{197,198} 将来的监测系统应包括各种导管有关的血流感染。

4. 估算插管日以确定 CLABSI 的发病密度。

a. 估算插管日的天数可以便于人力有限的单位开展监测。¹⁹⁹⁻²⁰¹

5. 使用涂银的导管连接器减少体外部分导管腔内污染。²⁰²

a. 有少量临床证据显示常规使用涂银的导管连接器或使用其它抗生素连接导管能减少风险。

6. 标准的、不含抗生素的透明敷料与 CLABSI 的风险。

a. 最近的一项荟萃分析 (meta-analysis) 报告 CLABSI 与透明敷料使用有关。但是报告这种相关性的荟萃分析的源头研究质量非常低。²⁰³

7. 含氯己定产品使用影响细菌对氯己定

的耐药。

- a. 广泛使用的氯己定为基础的产品（如使用氯己定沐浴、消毒剂和敷料）可能会促使氯己定对某些细菌株敏感性降低。然而，氯己定敏感性检测方法没有标准。革兰阴性菌对氯己定敏感性降低对临床的影响尚且不知。

第五部分 执行效果评价

I. 内部报告

执行效果评价用于支持医院内部质量改进，^{205,206}但不一定能同时满足外部报告的需求。这里建议的过程测量和结果测量来源于已经发表的指南、其他相关文献和专家观点。过程测量和结果测量的结果要向医院高层领导者、护理领导者和负责 CLABSI 高危风险病人护理的临床人员报告反馈。

A. 过程测量

1. 根据插管记录衡量对 CVC 插管指南的依从性。
 - a. 在医疗机构中所有进行 CVC 插管的场所都要开展核查表的依从性评估（如 ICU、急诊、手术室、放射科和普通护理病区），并且指派熟悉导管护理任务的医疗专业人员完成此项工作。
 - i. 中心导管核查表见 <http://www.ihl.org/knowledge/Pages/Tools/CentralLineInsertionChecklist.aspx>.
 - b. 测量在 CVC 插入过程中进行正确的手卫生、使用最大限度无菌屏障预防措施、在穿刺部位使用氯己定为基础的皮肤消毒剂这些措施的依从性百分比：
 - i. 分子：记录了在 CVC 插入中全部执行 3 个预防措施（洗手、使

用最大限度的无菌屏障预防措施、使用洗必泰为基础的皮肤消毒剂的数目。

- ii. 分母：所有 CVC 插入的数目。
 - iii. 乘以 100，测量结果以百分比表示。
2. 关于继续使用 CVC 必要性日评估记录的依从性。
 - a. 测量带管病人中有日评估记录的百分比
 - i. 分子：有日评估记录的 CVC 病人人数。
 - ii. 分母：CVC 病人数量。
 - iii. 乘以 100，用百分数表达。
3. 连接前清洁导管接口和注射口的依从性（或使用含有消毒剂的接口保护器）
 - a. 通过实践观察评估
 - i. 分子：观察到在使用前清洁导管连接接口或注射口（或注射口保护器）的次数。
 - ii. 分母：观察到导管接口或注射口连接次数。
 - iii. 乘以 100，用百分数表达。

B. 结果测量

1. CLABSI 率

a. 使用 NHSN 定义

- i. 分子：每一个病区内评价 CLABSI 数量。
- ii. 分母：每一病区内评价导管留置总天数（使用 NHSN 定义）。
- iii. 结果乘以 1000，表示为每 1000 导管日中 CLABSI 数量。
- iv. 风险调整：根据不同病人护理病区对 CLABSI 分层。
 - (a) 如果可能，与医院的历史数据和 NHSN 数据比较。

II. 外部报告

HAI 公众报告在向消费者和其他利益相

关者提供有用信息的同时并防止意外结果仍面临许多挑战。HICPAC、联合公共政策委员会下的医院相关感染工作组和国家质量论坛已经发布关于 HAI 公众报告的建议。

A. 州政府和联邦要求

1. 如所在州有强制报告 CLABSIs 要求的，医院必须收集和报告所要求的数据。
2. 对于州和联邦政府要求的信息，与所在州或当地的卫生部门联系。

B. 外部质量协作要求

1. 参加外部质量协作或州内项目的医院必须按照协作或项目要求进行数据收集和报告。
2. 测试者可靠程度的问题可能会影响不同机构之间的比较。

第六部分 落实策略的举例

责任制是预防 HAI 的基本原则，是在科学和落实之间需要提供必须的转换连接。没有责任制，即使再科学的实施策略也会被前后不一、支离破碎地使用，降低预防 HAI 的有效性。责任制需要从执行院长（Chief Executive Officer, CEO）和其他高层领导者开始。他们把预防 HAI 作为当务之急，因此 HAI 预防要成为院内优先考虑的事情。高层管理者负责提供足够资源满足有效落实 HAI 预防项目的需求。这些资源包括必要的人员（临床和非临床）、教育培训和设备（见表 2）。

CVC 插管是最常见的病人床旁操作之一。插管操作仅仅体现了 CLABSIs 风险的一方面，而 CLABSIs 风险已经扩展到 CVC 留置期间护理和维护的所有方面。与此同时，随着新研究发表，CLABSIs 预防策略也已经扩展，同时落实这些策略的经验也不断增加。这里讨论着重于 CLABSIs 预防的参与、教育、执行和评价策略。根据发表的文献和专家观点形成以下建议。

I. 积极参与

成功减少 CLABSIs 的第一步是在过程和结果的改进计划中获得一线工作人员和高层领导者的支持。²¹⁵

- A. 建立多学科团队，设定目标，确定落实过程步骤，监视目标达成的过程。定期举行团队会议。²¹⁶
- B. 关注安全文化，包括团队工作、技术过程和推动预防 CLABSIs 的责任制。
- C. 让所有参与者认识到问题的真实性，以增加认同性。完成这一目标的策略是发现病区内曾经受到 CLABSIs 伤害的病人²¹⁷，并与大家一起分享那段经历。
- D. 发现和吸收当地领袖人物。让输液护士或血管通路专家加入到团队中，包括正式（如医疗或护理负责人，主管护士）和非正式（如一线）领导者。²¹⁸当地领袖人物能促使同行参与、教育培训同行，增加项目成功的可能性，从而增加所有参加人员的支持和认同²¹⁵。这些领袖人物能影响策略的发展，可以与病区文化很好地匹配。领袖人物与一线工作人员间必须要经常交流，解决问题，持续改进。²¹⁵
- E. 定期与每个病区分享结果数据。数据可以是每月 CLABSIs 率和/或最后一例感染的持续时间。²¹⁷考虑用标准化感染率（SIR）报告 CLABSIs 率，用趋势图显示。
- F. 利用同行工作网络。不同医院之间自愿形成的同行工作网络能推动并确保循证措施的依从性，同时也便于合作、执行效果评价和责任制。所有医院能从分享最佳实践中获益，也可以群策群力，解决共同问题。²¹⁹

II. 教育培训

- A. 对于 CVC 插管、护理和维护的教育项目，其目标是改变行为。已经对采取不同教育方法和策略减少 CLABSIs 进行

- 研究。总之，这些教育干预表现出 CLABSI 率的改进，但需要更多的研究才能清晰地理解什么是最有效的教育策略、应教授什么内容、演讲时间长短和项目重复的频率等。^{220,221} CVC 的腔外感染、腔内感染途径都应被列入教育计划中。
- B. 医院内所有医务人员的教育项目应包括所有类型 CVC 导管的插管和护理知识、批判性思考、行为和心理运动技巧、态度和信仰。发现和分析这些领域的不足后，选择可测量的学习目标、课程内容和相应适合的教育策略。感染预防的重要性应贯穿在全部教育中并不断强化。^{221,222}
- C. 成年人需要利用多种方法学习，因此也需要使用多种教育策略。这些策略包括自我指导学习、指导教师主导的课程和小组讨论、团体讨论。教育计划团体应有多种专业的代表，包括医生、护理管理者、护士、输液护理专家和感染控制人员。²²³⁻²²⁵ 在保持信息和行为改变方面，单纯的授课的效果不佳，学习者应用主动地参与教育方法。^{226,227} 根据学习者的需求和能力选择学习方法，同时也要结合机构的技术能力。这些包括印刷学习课件；音像形式，诸如幻灯片展示和视频；技术实验室；杂志俱乐部和护理总查房；计算机、互联网或 DVD 形式的学习材料。^{58,224,228-231} 根据特殊问题或主题采取多种学习方法并且反复进行，得到的 CLABSI 减少效果要比单一结构的填鸭式教学或演讲要好。^{61,232}
- D. 为快速提醒并强化正确操作，临床环境中应便于获得其他教育工作辅助材料。这些包括但不限于机构内政策和操作、海报、人工图表、小型口袋卡片、电子邮件信息以及通过屏保发送信息。^{233,234}
- E. 为加强病人安全，CVC 插管技术学习需要有一个有组织的教育项目，先是获得知识，再在模拟环境中插管，随后在监督下对病人进行操作。^{43,235-237} 一项有 20 项研究的荟萃分析发现使用 CVC 插管模拟练习对学习者在表现、知识和自信方面有益。⁶⁶ 模拟 CVC 插管技术包括使用解剖模型和计算机建立虚拟现实。²³⁸ 其他方法已经尝试模拟组织穿刺的感觉。²³⁹
- F. 在允许进行没有监督的独立插管之前，所有医疗专业人员应有 CVC 插管、护理和维护能力的书面记录。应使用标准化能力评估表评估并记录每一个进行 CVC 插管和护理维护相关过程的能力（如敷料更换）。能力评估列表应对内部等级评价的可信性和有效性评估。对学习者的能力进行评估的专业人士应胜任其评估过程。^{220,240}
- G. 当插管护理 CVC 中的产品、设备或技术发生改变时，需要对所有使用产品的医务人员进行足够的培训。这种培训之前，应先使用该设备一段时间并对设备及其对 CLABSI 的影响做好评估。绝大部分设备制造商会雇佣有临床经验的人员提供产品培训，不应忽视这种资源。
- H. 使用 CVC 输液的医疗人员应有所有操作能力的书面记录，记录应包括但不限于导管固定、导管敷料更换、静脉内管理设置处置、无针连接系统消毒、接入注射口以及冲管和封管。⁴³ 这些证明应在模拟室或临床实际环境中由有资质人员观察下确定。^{241,242}
- I. 教育项目的评价包括学习者对项目的满意度、知识的改变和工作行为的变化。书面考试是最常用的测量方式，但这仅局限于知识获取方面，并可能在许多成

年学习者中产生焦虑。其他形式的评价包括在团队讨论时所做贡献及其模拟操作的观察。对医疗人员就目前 CVC 插管和护理相关知识水平进行测试,可以为设计教育培训项目提供有用的信息。^{243,244}

- J. 在教育项目之前,有计划地把学习从教室转换到临床实际中。使受训者能够应用新学的知识、实践新技术,使其有能力跟踪临床表现所产生的问题。
- K. 适当教育病人和/或家属关于所有 CVC 护理操作(如手卫生、敷料更换、静脉内管理套装处置以及冲管和封管)知识,特别是当环境发生变化时(如家庭护理,急诊环境)。^{43,242}
- L. 必须对机构内的管理者进行教育,确保有足够的资金支持 CLABSI 预防措施的 实施。²⁴²另外,CLABSI 的零容忍目标要由机构内最高管理者制定,²⁴⁵但是能否达到目标则取决于一些因素。

III. 执行

- A. 考虑使用质量改进方法,如 6 Σ 法,疫病病区基础的全面安全项目,团队 STEPS, PDCA 以及其他类似的方法建立预防努力;也可以使用各种绩效改进工具,如仪表盘、积分卡,与利益相关者分享数据。
- B. 标准化过程。通过落实指南、组合措施和治疗方案来实现针对中心导管的插管和维护。考虑执行每日有组织的多学科查房。查房期间要讨论病人是否需要中心导管、当天病人的目标、可能障碍或安全问题。²¹⁷向工作人员授权,让他们有权向相关领导报告过程缺陷或落实过程中遇到的障碍。这样便于快速干预和改进过程。对特殊部门或功能要签署遵守责任状。^{217,218}
- C. 建立备份。建立备份或独立检查护理提

供过程,提高工作人员依从性。通过结合视觉提示提醒达到正确的操作。在 ICU 内外,对插管操作及其维护执行核查表。考虑使用屏保信息、海报、旗帜、实况表、事先印刷的医嘱套餐、袖珍卡片和其他教育形式和服务作为工作人员提醒物。

- D. 考虑参加减少 CLABSI 协作组。协作组给组织提供机会去发现和分享最佳实践和利用相关的结果数据。

IV. 评价

- A. 利用多学科团队形成质量改进协作组,建立目标和发现测量关键因素。^{246,247}这些团队应有来自管理、所有科室、临床护理单元的代表。^{54,248,249}这些团队也可以代表一家医院或多家不同医院。
- B. 评价包括过程评价和结果评价。²⁴⁶也应考虑不同年龄组(如新生儿、儿童和成人)。^{54,249,250}
- C. 过程测量包括但不限于插管组合措施依从性、CVC 使用插管部位或类型(如股静脉插管和其他 CVC 部位、PICC 与中心导管)、CVC 敷料的情况和及时更换敷料、无针连接系统的完整性以及正确管理、其他添加的设备、静脉内管理套装^{43,251,252}。设备使用定义为插管天数除以病人住院天数。²⁴⁵
- D. 建立导管护理循证操作的依从性基线,如敷料清洁和完整性。
- E. 结果测量是 CLABSI 的发生率和各种血管途径设备相关其他感染率(出口部位感染,化脓性血栓性静脉炎)。考虑用 SIR 报告 CLABSI。
- F. 过程测量和结果测量的数据应与初始能力评估和后续能力评估结合起来。初始能力评估应包括在雇佣时评价、在定位之后以及使用新设备或新技术时。后续能力评价用过程和结果数据

来确定，并结合机构内确定的反复能力评价频率。⁴³

- G. 教育培训结果的评估需要在几个层面展开，在项目完成后评价学习者对项目的满意度。这种形式包括学习者自我评价是否成功达到学习目标。下一层面是测量学习者知识水平改变的评价，通常采用比较测试前后得分完成。第三个层面是测量项目完成后临床实际工作中的行为改变。仅使用第一个和第二个层面评价不能确保临床行为改变。

许多因素会影响 CLABSI 的监测，包括 CVC 的类型、CLABSI 的定义、血培养操作和书面政策、实验室操作以及工作人员态度和信念。这些因素的标准化能够促进组织内部及组织间的业绩。另外，这些决定因素的不同可能影响公开报告的 CLABSI 率，影响

医院获得报销的条件。^{32,247}

- H. ICU 外的 CLABSI 的监测变得更加普遍，特别是在更多地使用电子技术进行数据收集的情况下。^{253,254}
- I. 对任何评价项目的成功来说，向所有健康护理人员反馈至关重要。以病区为基础的发现低 CLABSI 率或 CLABSI 事件延长的间隔时间是鼓励工作人员积极参与的有效方法。改进的目标应明确，并经常阐述。审核完成插管核查表的依从性，与工作人员分享这些数据。其他的反馈形式包括定期（如每月，每季度）分享过程测量的数据（如电子邮件，书面报告）、海报、报告或其他形式的分享，用图形显示过程测量累计依从性。

^{245,250,255,256}

[葛茂军，张亮，周华，宋晓岩 译]

表 1 证据质量分级

级别	定义
<input type="checkbox"/> 高	高度可信，结果真实，与估算样本大小和效果方向关系密切。证据评价为高，因为研究的范围没有很大限制，研究之间很少变量，总概算可信区间很窄。
<input type="checkbox"/> 中	真实效果，可能与估算大小和效果的方向关系密切，但有可能存在实质上不同。证据分级作为中等质量，因为仅有少量研究和一些研究有限，但没有大错误，研究之间有一些变化，或总概算可信区间有些宽。
<input type="checkbox"/> 低	真实效果，但在估算大小和效果方向存在本质上不同，支持的研究有大错误，研究之间存在重要的变异，总概算的可信区间很宽，没有严格研究，只有专家意见。

表 2 医院感染预防责任制基本内容

高层管理者负责确保医疗系统支持医院感染预防与控制（IPC）项目，使其有效地预防医院相关感染和流行病学上重要致病原的传播。
高层管理者负责确保足够数量的经培训人员，能指定 IPC 项目，以及在医院感染预防方面至关重要的其他部门（如保洁）有足够的人员。

高层管理者负责确保医院工作人员，无论有无执照，有足够的培训和能力胜任他们的岗位职责。
直接健康护理提供者（如医生、护士、辅助人员和治疗师）和辅助人员（如保洁和设备处理人员）负责，确保在任何时间都能实施正确的 IPC 实践（包括手卫生，标准预防和隔离，设备和环境的清洁与消毒）。
高层领导者和病区领导者负责保证其工作人员对自己行为负责。
IPC 领导者负责确保主动发现 HAI 项目的落实，HAI 数据分析，定期提供数据给利用信息进行护理质量改进的人员（如病区工作人员、临床医生和医院管理者），把循证实践整合到项目中。
高层领导者和病区领导者负责确保建立预防 HAI 的正确培训和教育项目，并提供给工作人员、病人及家属。
来自 IPC 项目的人员、实验室人员和信息技术部门人员负责确保系统工作正常，支持监测项目。

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