以『臨床警示及決策支援系統』降低顯影劑誘發腎病變的機率

Utilizing Clinical Decision Support System to Reduce the Incidence of Contrast-Induced Nephropathy

中文摘要

CONTEXT：「腎功能不全」是顯影劑誘發腎病變(CIN)最重要的獨立危險因子，若將顯影劑注射於腎功能不全病患，可能引發腎臟病變。然而例行顯影性檢查時，可能因把關疏忽而導致此不良事件。決策支援系統可以偵測醫師排檢行爲並減少醫療疏失。

PURPOSE：在先導研究中，先檢視例行顯影檢查流程，定義出潛在不良事件的風險種類。再由回溯性定量分析，測量潛在不良事件的發生頻率。並對醫師進行問卷調查，分析檢查流程的缺陷及醫師可接受的加強安全方式。在主要研究中，建立一個目的在「降低將顯影劑注射到腎功能不全患者之機率」的臨床決策支援系統，並評估其降低「潛在 CIN 風險」的效果及使用者評價。

INTERVENTION：建立一個「Anti-CIN」決策支援系統，架構在電腦醫令系統中，於醫師開立檢查時，對潛在 CIN 風險病人即時跳出警示，並提供決策支援。

MAIN OUTCOME MEASURES：「CIN 高風險」病人，在醫令系統定義血清 Creatinine 濃度大於 1.4 mg/dL 爲提示臨界值，「風險不明」之可能有害事件，意指在顯影檢查前未曾檢驗腎功能。

DESIGN AND SETTINGS：2006 年 2 至 4 月爲介入實驗期，令「Anti-CIN 系統」運作三個月，而 2003 年 1 月至 2005 年 12 月爲無介入的對照期間。

RESULTS：實驗組在三個月中，共有 1,308 筆嘗試由電腦醫令安排的顯影檢查，49 筆因 Anti-CIN 的警示而取消，其中 30 筆爲 CIN 高風險病人－13 筆是在警示時立即由醫令系統取消；另 17 筆原無腎功能報告，經提示，加驗腎功能後發現腎功能異常，最後取消檢查。這分別說明了系統的直接阻擋效應(13)與間接阻擋效應(17)。在醫師排檢時，由系統偵測到的高風險與風險不明病人比例，在門診 6.2% vs. 52%，住院 18.6% vs. 12.3%。面對門診的高風險病人，高達 67.3%的醫師承認在開單時不知病人爲高風險，經提示後，有 38.5%的檢查被取消。對原未驗腎功能的病人，提示後 22.5%決定加驗腎功能。若比較對照期間與介入期間「已完成」的顯影檢查，其總數各爲 10,761 vs. 1,015，系統介入後，在顯影檢查前有驗腎功能的比例在門診由 49.8%上升到 62%，統計極端顯著($p < 0.001$)。在住院部門，介入後風險分佈的改變並不顯著($p=0.243$)

CONCLUSIONS：在系統介入後，Anti-CIN 對門診病人的保護作用較大。對高風險者的取消檢查效應與風險不明者的加驗腎功能效應，可減少因醫療疏失所導致的顯影劑腎毒性，進而提高病患安全。

英文摘要

CONTEXT: Baseline renal insufficiency has been shown to be the most important independent risk factor of contrast-induced nephropathy (CIN). The effects of renal insufficiency on CIN may be neglected in daily contrast-enhanced image study-ordering practices. A clinical decision support system(CDSS) with computerized physician order entry(CPOE) may optimize physician's ordering behaviors and reduce medical errors.
OBJECTIVE: The purposes of 3 pilot studies are as follows: in the qualitative study, to identify and define the potential CIN adverse events by evaluating the decision flow of contrast-enhanced procedures; in the retrospective study, to measure the incidence of potential CIN adverse events; and in the physician-responded questionnaire survey, to identify an acceptable way to reduce the risk of CIN. In the main study, the aim is to determine whether a CDSS designed for reducing mis-injecting contrast-medium to patients with renal insufficiency would reduce the risk of CIN.
INTERVENTION: With a real-time Anti-CIN CDSS for monitoring physician's contrast-enhanced image study orders to patients with potential CIN risks, online pop-up reminder with optimized decision options were displayed when patients with high or unknown CIN risk were detected.
DESIGN AND SETTINGS: The Anti-CIN system was activated on the CPOE in one medical center for a 3-month intervention period from February to April 2006; compared with a 3-year control period without intervention from January 2003 to December 2005. All orders to arrange contrast-enhanced image studies were recoreded with patients' CIN risk.
MAIN OUTCOME MEASURES: The patients arranged to contrast-enhanced imaging with serum creatinine level greater than 1.4mg/dL are classified as high CIN risk and patients without renal function test(RFT) results are classified as unknown CIN risk.
RESULTS: A total of 1,308 orders from CPOE were included in the intervention period. 49 orders were cancelled, attributed to the interception of Anti-CIN system, of which 30 were high CIN risk patients. 13 of 30 cancelled orders were attributed to the direct order-canceling effect of the system. The other 17 were cancelled due to high risks which were identified in an indirect manner because initial reminding of no available RFT reports from the system facilitated further RFT checking, hence high risks detected subsequently. The proportion of high risk and unknown risk was 6.2% vs. 52% in outpatients, and 18.6% vs. 12.3% in inpatients, respectively. Among orders for high risk outpatients, physicians admitted that the risks were not noticed initially in 67.3% of them before alerts. 38.5% of them were cancelled after physicians were reminded. 22.5% of the orders for unknown risk patients were modified with further

RFT check after physicians were reminded. Risk distribution in completed contrast-enhanced image studies was further evaluated. A total of 10,761 and 1,015 exams were included in the control and intervention group respectively. The pre-imaging RFT checking rate increased significantly from 49.8% to 62% in outpatients after intervention ($p<0.001$). However, the change of risk distribution in inpatients was not significant ($p=0.243$).
CONCLUSIONS: The Anti-CIN CDSS merged with CPOE appears to result in reducing the potential CIN adverse events both by means of the order-cancelling effect to the high risk patients and the further RFT-checking effect to the unknown risk patients. The protective effect has proven to be more prominent to the outpatients than to the inpatients.