LETTER

Recent initiatives to enhance the safety of intravenous medications in Chinese hospitals

According to the 2018 China National Adverse Drug Reaction (ADR) Monitoring Report, intravenous medications accounted for 60.0% of the reported ADRs.¹ Over-reliance and improper administration of intravenous infusions are a severe health problem in China. A 2019 study reveals that 89.2% of patients received intravenous medications at a large Chinese academic hospital, and 11.4% of these prescriptions were inappropriate, ranging from improper diluents to contraindicated administrations.² Over the past two decades, hospitals have been exploring ways to address intravenous medication safety in China. Efforts are focused on building hospital information systems and pharmacy intravenous admixture services (PIVAS), targeting the entire intravenous medication use process: prescribing, order review, compounding and administration. This letter aimed to provide a brief update on several key intravenous medication safety initiatives in China.

PIVAS has been constructed in Chinese hospitals since 1999 to reduce patient morbidity and mortality caused by intravenous compounding, and PIVAS now exists in more than 1100 hospitals. Intravenous admixtures are compounded by PIVAS centres after prescription order review. However, the percentage of hospitals with PIVAS is still meagre at 3.3%. Further investment in PIVAS is urgently needed.

Leveraging information technology is critical in medication safety. Intravenous therapies are the responsibility of all

clinicians involved in the practice. Two notable advances are the development of an intravenous prescription early warning and assessment system (IPEWAS) by the Xiangya Hospital Central South University,³ and the PIVAS Clinical Decision Support Intelligent Sequence Annotation (PCISA) system developed by the Hefei Binhu Hospital.⁴ The IPEWAS has separate interfaces for physicians, pharmacists and nurses, and a management interface serving as a central repository for intravenous infusion therapy. The system can provide clinical decision support to physician prescribing, pharmacist verification and nursing administration of intravenous medications. For example, the nursing interface offers instructions on the rate and route of administration, and whether special precautions are needed, such as light protection and extravasation management.³ This platform has demonstrated its value in curbing the frequency of inappropriate administration of intravenous medications at the hospital.³ A hospitalised patient may receive multiple intravenous infusions throughout the day, and the administration sequence may affect efficacy and safety.⁴ Improper sequences may lead to physical changes of compounded admixtures (ie, turbidity and precipitation) and unnecessary tubing flushes in between incompatible infusions. Both pharmacokinetics and pharmacodynamics may affect the infusion sequences of intravenous medications, and eight infusion factors are considered in building the infusion knowledge database (table 1). The module contains all hospital formulary intravenous medications, and the PCISA performs sequence analyses for a given patient when multiple intravenous medications are prescribed. The PCISA is efficient in sequence analysis and leads to rational use of intravenous medications.⁵ The PCISA extends the functions of IPEWAS. The integration of these systems and full application in Chinese hospitals may effectively

enhance the safety of intravenous therapies for a patient during the entire medication use process.

Shusen Sun

Pharmacy Practice, Western New England University, Springfield, Massachusetts, USA

Correspondence to Dr Shusen Sun, Pharmacy Practice, Western New England University, Springfield, MA 01119, USA; ssun@wne.edu

Contributors SS: investigation, writing original draft.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; internally peer reviewed.

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To cite Sun S. *Eur J Hosp Pharm* 2020;**27**:e101.

Published Online First 28 August 2020

Eur J Hosp Pharm 2020;**27**:e101.
doi:10.1136/ejhpharm-2020-002412

ORCID iD

Shusen Sun <http://orcid.org/0000-0001-9014-7329>

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Table 1 Infusion knowledge databases/factors affecting administration sequences of intravenous medications

Knowledge database/factor	Rationale/comment
BUD	Impacts the stability of compounded admixtures, infuses medications based on BUDs within the same batch
Infusion incompatibility	Schedules a third infusion to separate the two incompatible infusions to avoid tubing flush or flushes the intravenous tubing in between incompatible infusions when a third infusion cannot be scheduled
Premedications before chemotherapy drugs	For example, gives anti-nausea medications first to prevent chemotherapy-induced nausea
Sequence-dependent chemotherapy drugs	Schedules the sequence based on the pharmacokinetics and pharmacodynamics of the chemotherapeutic drugs, for example, infuse paclitaxel before cisplatin in the combination therapy to reduce neutropenia
Vein-irritant drugs	Infusing the most vein-irritating drug first to protect peripheral veins
Chronopharmacology	For example, scheduling high-dose glucocorticoid infusion between 07:00 and 08:00
Therapeutic drugs before adjuvant drugs	Achieves optimal therapeutic effects
Dosing frequency	Standardises administration times based on dosing frequencies
BUD, beyond-use date.	