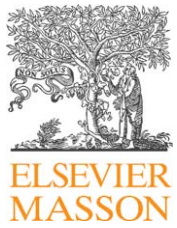
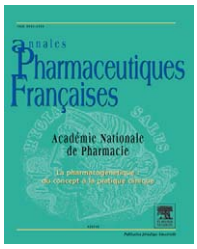
Annales Pharmaceutiques Françaises (2011) **69**, 30—37





ORIGINAL ARTICLE

Centralized intravenous additive services (CIVAS): The state of the art in 2010

UCRI, unité centralisée de reconstitution d'injectables : le point en 2010

J.-D. Hecq

Université catholique de Louvain, cliniques universitaires UCL de Mont-Godinne, 1, avenue Therasse, 5530 Yvoir, Belgium

Received 10 June 2010; accepted 14 September 2010
Available online 30 December 2010

KEYWORDS
CIVAS;
Compounding;
Errors;
Patient care;
Patient safety;
Intravenous infusion

Summary In hospitals, the major part of the drugs is administered by intravenous way and the majority of the reconstitution of injectable drugs are carried out right before the administration to the patient by the nursing staff. The risks and errors related to the preparation and the administration of the injectable drugs are numerous. The standardization then the centralization of the preparations and reconstitution by the hospital pharmacy make it possible to reduce these various risks and errors. In addition to the preparation of the mixtures of parenteral nutrition as well as doses of anticancer chemotherapy, many other treatments can be taken in charge, such as antibiotics, antiemetics and pain treatments. Consequent equipment is necessary but the realization of these treatments proves non-overdrawn insofar as a certain quantity of production is reached. The reconstitution of the intravenous treatments by a centralized intravenous admixture service guarantees the chemical stability and the microbiological quality of the ready-to-use injectable drugs and contributes to the quality and the total management of the care of the patient.

MOTS CLÉS
Erreurs ;
Perfusion intraveineuse ;
Préparation médicamenteuse ;

Résumé En milieu hospitalier, la majeure partie des médicaments est administrée par voie intraveineuse et la plupart des reconstitutions des injectables sont réalisées juste avant l'administration au patient par le personnel infirmier. Les risques et erreurs liés à la standardisation puis la centralisation des préparations et reconstitutions dans le service de pharmacie hospitalière permettent de réduire ces différents risques et erreurs. Outre la préparation des mélanges de nutrition parentérale ainsi que des doses de chimiothérapie anticancéreuse,

E-mail address: Jean-Daniel.Hecq@uclouvain.be

0003-4509/$ — see front matter © 2010 Elsevier Masson SAS. All rights reserved.
doi:10.1016/j.pharma.2010.09.002

Sécurité des patients ;
Soins des patients ;
Unité centrale de reconstitution d'injectables

de nombreux autres traitements peuvent être pris en charge, à savoir les antibiotiques, les antiémétiques et les antidouleurs. Un équipement conséquent est nécessaire mais la réalisation de ces traitements s'avère non déficitaire pour autant que l'on atteigne une certaine quantité de production. La reconstitution des traitements intraveineux par une unité centralisée de reconstitution d'injectables garantit la stabilité chimique et la qualité microbiologique des doses injectables prêtes à l'emploi et contribue à la qualité et au management global des soins du patient.

Place of injectable drugs in hospital treatments

In hospitals, the major part of the drugs is managed by intravenous way. The majority of the reconstitutions of injectable is carried out right before the administration by the nursing team. Lastly, the operating room is generally the only aseptic zone except if the hospital institution has aseptic units for cancer patients.

Several authors tried to quantify the quantity of injectable administrated to the patients.

Turco [1] reports that 24% of the administered doses to hospitalized patients are injectable drugs, while 38% of the patients receive at least an injection per day.

According to Simmons [2], 30 to 50% of the patients receive medications by intravenous way, percentage confirmed by Taxis and Barber (28%) [3].

Kwan and Anderson [4] estimate that 40% of medications and solutions are managed by intravenous way while Rwabihama et al. [5] note that 49% of the patients are under perfusion.

The risks related to the preparation and the administration of the injectable drugs are numerous:

- incomplete and ambiguous regulations;
- procedures of the complex preparations;
- missing of essential technical information;
- multidisciplinary absence of process;
- error of selection of the drug and/or the diluent;
- use of the drug, the diluent or the aqueous solution after expiry date;
- miscalculation;
- physicochemical incompatibility;
- error of patient;
- error of route of administration;
- bad technique of preparation and/or asepsis;
- protection of the operator and/or the environment;
- varied levels of knowledge, experiment and competence in the personnel of care [6].

Forms of the injectable drugs

The pharmaceutical companies provide the injectable drugs in the form of ampuls, flasks of powder, concentrated solutions or mini-perfusions.

Minimal qualities of these forms are physicochemical stability, sterility, the absence of particles and pyrogenic substances as well as long-term validity.

These qualities must be preserved in the administered perfusion to the patient.

Factors affecting drug stability

Many authors studied and detailed the physicochemical factors influencing the stability of the molecules in solution [7—19].

A drug is considered stable in solution insofar as it preserves 90% of the initial concentration (United States Pharmacopeia [USP] standards).

To determine this stability, the concentration of the active ingredient will be performed by high-pressure liquid chromatography or gas chromatography, microbiological test (for certain antibiotics) or by any other specific test making it possible to differentiate the active molecule from its breakdown products.

Moreover, there cannot be a decomposition of the active ingredient in toxic product and the initial appearance of the solution cannot be modified.

In short terms, when one wants to evaluate or know the stability of a drug in solution, it is necessary to know:

- final concentration of the reconstituted product;
- nature, pH and ionic force of the diluent;
- pH and ionic force of final dilution;
- nature of container (polyvinyl chloride, ethylvinyl acetate, polypropylene, etc.) to avoid the phenomenon of sorption and salting out;
- conditions of storage (refrigerator, ambient temperature, body temperature, protection from light);
- nature of the set of administration (PVC, polyethylene, etc.);
- protection from the light during the administration.

Methods of preparation and/or reconstitution

The principal methods are the syringe, the set transfer, the sophisticated perfusions or the sophisticated flasks.

The syringe is one of the systems most used for the reconstitution of the injectable drugs.

The set transfer is also strongly used, either in the shape of a double needle, or in the shape of a double needle itself surrounded by a plastic protection. Among the sophisticated perfusions, let us quote the minibag, which is equipped at the site of injection with a receptacle making it possible to