To develop and execute a validation plan for a Baxter Exactamix® compounder used for the preparation of parenteral nutrition

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Introduction

- Parenteral nutrition (PN) is a highly complex, high risk therapy which must now be prepared in a pharmacy aseptic unit, following NPSA Alert 7 in 2016.
- In order to reduce the chemical, microbial and operator risks, automated compounders may be used to prepare PN.
- An automated process also helps prepare solutions with multiple ingredients to meet the demands of the increasingly complex clinical needs of patients[1].
- In order to maintain a quality service, validation of this equipment is required.
- The Baxter ExactaMix®2400[2] is used at SMPU to prepare PN under the section 10 exemption of the Medicines Act 1968 (Welsh Health Circular 2024/004)[3].
- Baxter commercially supply ExactaMix®2400 (EM2400) compounders however, in the UK, no responsibility is taken for validating them.
- Given there are no national compounder validation guidelines, each PN manufacturing unit must therefore independently develop a validation plan leading to duplication of effort and use of valuable NHS resources together with increased potential risks associated with validation plan quality, inconsistencies and/or timeliness of execution.

Methods

Research — Other centres were contacted. The ExactaMix®2400 manual was studied and used to identify compounder functional risks which informed the development of the associated validation tests.

Gap analysis and risk assessment — Gap analysis and risk assessments were also carried out

Validation tests written — Using the EudraLex Guide (volume 4 Annex 14), a series of 20 validation tests (with associated acceptance criteria) were developed including microbial, chemical and information technology (IT) approaches.

Protocol development — Protocol development and initial testing was executed outside the clean-room using an identical compounder. Once refined, the full set of tests were repeated on the in-situ compounder inside the clean-room.

Results

A validation plan incorporating the tests shown below was developed and approved by Quality Control. All microbial testing met the acceptance criteria. Some chemical tests required development due to interference of PN ingredients on the testing equipment resulting in inaccurate results, however all chemical and IT tests subsequently met the acceptance criteria. Individual tests all make up the OQ/PQ

Test	Objective of test
DQ	To outline the requirements and expectations of what is required
IQ	To ensure the equipment is functional
Transfer validation	To ensure the procedure for transferring equipment into the clean room is sufficient to reduce microorganisms to an acceptable level
Process validation	To replicate a usual day of filling parenteral nutrition on the EM2400 using nutrient broth in place of ingredients. To monitor environmental conditions at this time
Load cell	To verify that the load cell accurately weighs solutions pumped by the EM2400
Specific gravity review	To ensure specific gravity figures are reviews and correct
Flow Factors	To measure the flow factors on all ingredients used during compounding on slow and fast speeds.
Bar code scanner	To ensure the barcode scanner correctly scans ingredients with barcodes, inlet barcodes and printed barcodes (for products without barcodes on the original packaging)
ABACUS.PAT file transfer	To prove the EM2400 can be operated using the barcode scanner and to ensure ABACUS software is recognised to mimic a normal day of compounding
Chemical test	To ensure the EM2400 is delivering accurate concentrations of electrolytes
Minimum fill	To verify the EM2400 delivers minimum columes within the limits specified by the manufacturer for volumes of 0.2mL, 0.4mL, 1mL, 11mL
System flush	To ensure solutions are flushed from the inlets and valve set into the final container effectively by the universal ingredient
Maximum volume	To verify the EM2400 can fill to the maximum fill volume of 5000mL
Alarm functions	A series of 3 tests looking at the incompatible group alarm, occlusion alarm and bubble alarm
Y-site	To confirm that a solution can be assigned to multiple ports
Report generating	To ensure all reports can be generated
System security	To verify that suitable system security is in place with individual user defined permissions identified
Growth promotion	To prove other ingredients in the broth bag do not inhibit the growth of organisms within the nutrient broth
Validation of the monthly clean	To ensure the monthly cleaning of the EM2400 is sufficient to reduce the number of microorganisms to an acceptable level
Calibration of the 2kg weight	To ensure the 2kg weight used to calibrate the EM2400 load cell is calibrated annually

Aim

To develop and execute a validation plan for the Baxter ExactaMix®2400 PN compounder.

Discussion

- There is a lack of national guidance on validating the ExactaMix®2400 compounder to ensure safe preparation of PN.
- SMPU have developed a series of validation tests to assure safe use of the ExactaMix®2400 compounder and reduce any associated patient risk. These tests are now executed 6 and 12 monthly according to an annual schedule.
- Further work is required to establish nationally approved PN compounder standards and validation protocols leading to greater assurance and safer use of these essential clinical products and services.

Conclusion

- There is a lack of national guidance on validating the ExactaMix®2400 compounder to ensure safe preparation of PN.
- SMPU have developed a series of validation tests to assure safe use of the ExactaMix®2400 compounder and reduce any associated patient risk. These tests are now executed 6 and 12 monthly according to an annual schedule.

Future work

Further work is required to establish nationally approved PN compounder standards and validation protocols leading to greater assurance and safer use of these essential clinical products and services.

References:
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