The work overload is related to an increased risk of error during chemotherapy preparation: a pilot simulation study

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**Objectives**

Chemotherapy preparation units have to manage an increase of activity with constant staff. Safety is therefore threatened. The objective of the study was to measure the effect of a work overload:
- on preparations accuracy
- on errors.

**Method**

- **A simulation study** using tracers (lidocaine and phenylephrine) was conducted in an operational context.
- **21 operators, 1007 preparations**
- **Study:**

  3 randomised blocks of 1, 2 or 3 series of 8 randomised preparations at different dosages and volumes, starting from 2 concentrations of stock solutions were compounded.

**Results**

- **Preparation time:**

  A gradual reduction of the preparation time, inversely correlated with the workload, was observed. The average time for a preparation was 4min39s, 3min13s and 2min38s for sessions with 8, 16 and 24 syringes, respectively (p <0.001).

- **Accuracy:**

  The mean accuracy of the syringes concentrations measured by quantitative analysis was not different between the three series (p=0.23, mixed-effect Cox model regression).

- **Error:**

  The error rate (qualitative and quantitative analysis) increased with the number of preparations made in 1 hour: 1.8%, 2.7% and 5.4% for 8, 16 and 24 syringes, respectively. The difference was statistically significant (mixed-effects logistic regression, p=0.049).

**Conclusion**

Operators increased their working speed
- without impacting mean doses accuracy
- with a greater probability of making a mistake
- with a large proportion of inaccurate preparations

The inclusion of robust control methods in the process can be recommended.

The results encourage to avoid work overload and to take actions to smooth the activity over the day.

**Analysis**

**Quantitative criteria**

- Validated CE methods
  - accurate (<5% deviation)
  - weakly accurate (5-10%)
  - inaccurate (10-30%)
  - error (>30%)

**Qualitative criteria**

- Visual observations
  - wrong stock solution
  - wrong diluent
  - labelling error

- Time cumulated over all preparations

- Time per preparation

- Distribution of preparations (%)

- Based on deviation from the target dose

- Number of errors per type and per block

- Type of errors

- Error of labelling

- Error of diluent

- Error of active ingredient

- Dose >30%