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

L. Carrez\(^1,2\), L. Bouchoud\(^1\), S. Fleury\(^1\), C. Combescure\(^3\), L. Falaschi\(^1\), P. Bonnabry\(^1,2\),
\(^1\) Pharmacy, Geneva University Hospitals, Geneva, Switzerland
\(^2\) School of Pharmaceutical Science, University of Geneva, University of Lausanne, Geneva, Switzerland
\(^3\) Faculty of Medicine, Division of Clinical Epidemiology, Geneva University Hospitals, Geneva, Switzerland

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.

![Fixed time of 1h](image)

1x8 syringes=8:
- 4 x phenylephrine
- 4 x lidocaine

2x8 syringes=16:
- 8 x phenylephrine
- 8 x lidocaine

3x8 syringes=24:
- 12 x phenylephrine
- 12 x lidocaine

Analysis

Qualitative criteria
Visual observations
• wrong stock solution
• wrong diluent
• labelling error

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

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).

![Graph](image)

• 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).

![Graph](image)

• 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).

![Graph](image)