


Impact of workload on preparations quality in chemotherapy: a pilot simulation study

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Background

Chemotherapy preparation units have to manage an increase of activity with constant staff. Safety is therefore threatened.

Purpose

Measure the effect of a work overload on preparations accuracy and error.

Material and methods

A simulation study using tracers (lidocaine and phenylephrine) was conducted in an operational context.

12 operators, 576 preparations

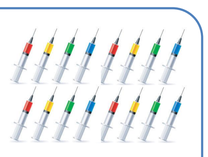
Study

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.

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

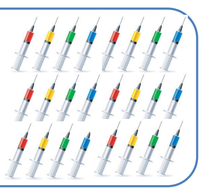
Fixed time of 1h

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



Fixed time of 1h

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



Fixed time of 1h

Analysis

Qualitative criteria

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

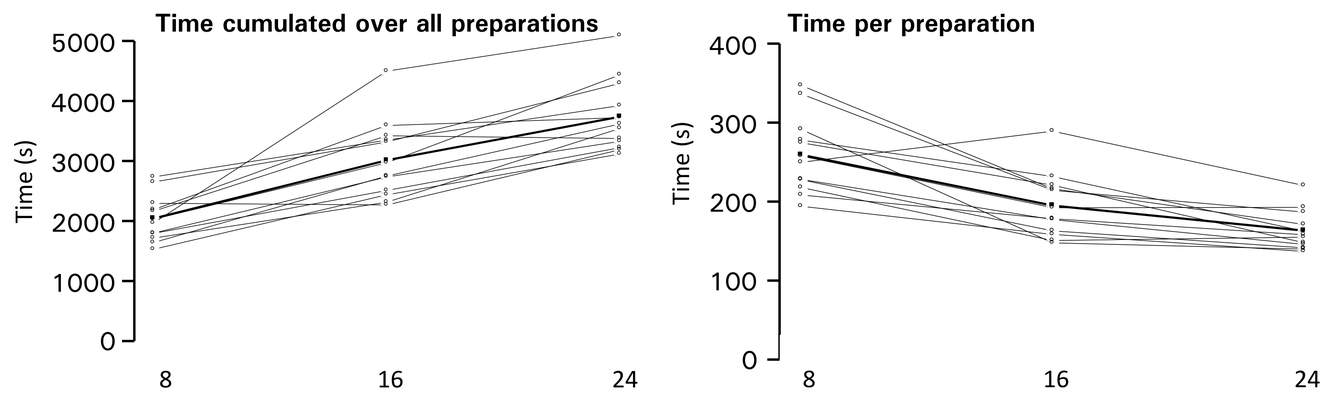
Quantitative criteria

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

Results

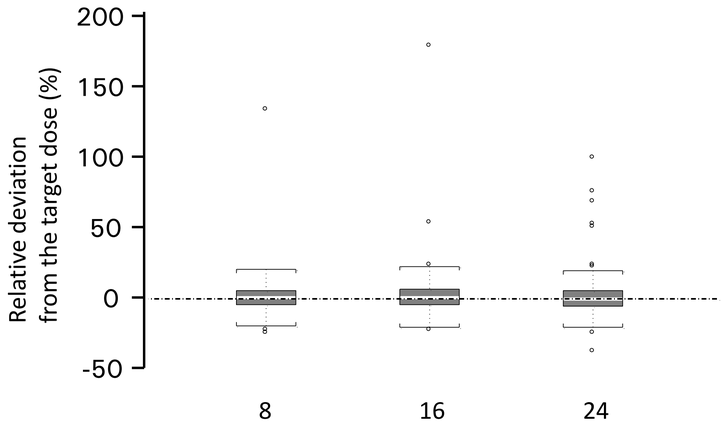
Preparation time:

A gradual reduction of the preparation time, inversely correlated with the workload, was observed. The average time for a preparation was 4min11s, 3min07s and 2min35s for sessions with 8, 16 and 24 syringes, respectively ($p < 0.0001$).



Accuracy:

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

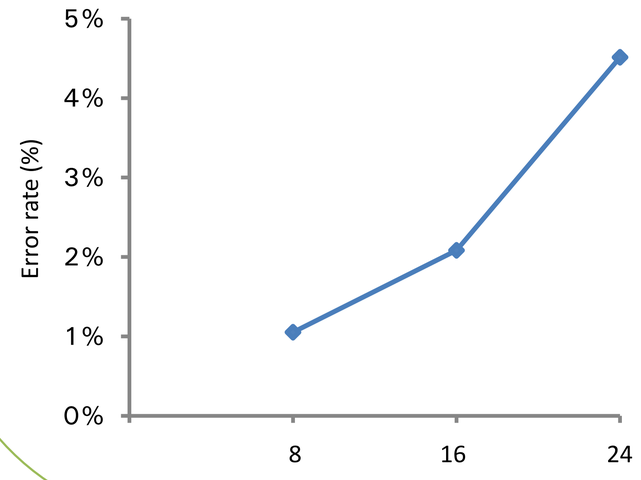


Distribution of preparations (%) based on deviation from the target dose

	X ≤ ±5%	±5 < X ≤ ±10	±10 < X ≤ ±30	±30 > X
8	57%	26%	16%	1%
16	51%	25%	23%	1%
24	49%	32%	17%	2%
3 series	52%	28%	19%	1%

Error:

The error rate (qualitative and quantitative analysis) increased with the number of preparations made in 1 hour: 1.1%, 2.1% and 4.5% for 8, 16 and 24 syringes, respectively. The difference was not statistically significant (mixed-effects logistic regression, $p = 0.15$), possibly due to a lack of power.



Number of errors per type and per block

Type of errors	Error of labelling	Error of diluant	Error of active ingredient	dose > 30%
8	0	0	0	1
16	0	2	0	2
24	6	0	1	6

Conclusion

Our pilot study shows that operators are able to increase their working speed without impacting doses accuracy. However, a large proportion of inaccurate preparations was observed and the inclusion of robust control methods in the process can be recommended. The acceleration of manual production rate appears to be possibly associated with a greater probability of making a mistake, but this trend has to be confirmed in a larger sample size study (a multicenter study is ongoing). The intermediate results encourage to avoid work overload and to take actions to smooth the activity over the day.

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http://pharmacie.hug-ge.ch/rd/posters/WorkloadCytotoxics_EAHP16.pdf