0.4 hour for shortage analysis, 0.4 hour for solution research, 0.3 hour for alternative medicine market creation and 0.1 hour for closing shortage files. The overall time allocation was 33% for pharmacy residents, 31% for pharmacy technicians, 27% for pharmacists, 6% for administrative agents and 3% for pharmacy students. The mean time per shortage was 0.7 hour: 0.7 hour per shortage with quotas that needed medical validation, 0.6 hour per shortage with equivalent medicine and per shortage which implied stock monitoring, 0.5 hour per shortage with supply quotas and per shortage with near equivalent medicine, and 0.3 hour per shortage without alternative.

Conclusion These results may have been underestimated because of difficulties in data collection and because the time spent by clinical pharmacists was not implemented. However, this study shows precisely the time spent in managing shortages and will be useful in staff organisations as shortages are increasing.

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No conflict of interest.

2SPD-039 MEDICINE SHORTAGES IN A GENERAL COUNTY HOSPITAL: EVALUATION AND ESSENTIAL QUALITY

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Background Medicine shortage in hospitals is defined as insufficient patients' supply, without generic substitution. The particular problem has been reported by both professionals and patients, and acknowledged by European institutions. The cited causes range from production disruptions to trade and distribution factors.

Purpose This study aimed to register medicine shortages in a middle-range general hospital during one year, analyse the causes and correlate them to medicines' anatomical therapeutic category (ATC) and essential quality.

Material and methods Medicine shortages were reported daily from 1 August 2017 to 31 July 2018 and analysed according to three causes: medicine's withdrawal (MW); manufacturing/importing problems (M/I); and delayed hospital pharmacy's response to stock replacement (HPR). Days to restore availability were recorded and categorised in two groups: 1–3 days (automated re-stock) and more than 4 days (pharmacists' involvement). Shortage cases were also stratified according to ATC. All medicines recorded shortages were classified into five classes using a Modified Essentiality List (MEL)[1]: 5, 4, 3, 2 and 1, with 5 attached to high priority.

Results Two-hundred and ninety-nine shortage cases were reported concerning 239 medicines. A new shortage case was reported every 1.2 days: 4% concerned MW, 40% M/I and 56% HPR. Average days to restore availability for M/I and HPR were 52 and 11, respectively. For M/I cause, 114 shortage cases (94.21%) needed more than 4 days to restore, while for HPR causes, 97 cases (58.43%). Neurological and cardiovascular regimens' shortages were first (26%) and second (15%) categories, regardless of cause. For M/I causes, neurological regimens' shortages were first (21%) and medicines for alimentary track and metabolism second (13%) categories. MEL class 5 comprised 53 cases (18%), including lithium, nitroglycerine, verapamil, loperamide and tuberculin. MEL class 2 comprised 152 (51%) cases.

Conclusion Shortage cases are very often reported to the hospital pharmacy. HPR is the more frequent reason for a shortage case, the quicker to resolve, and demands strong pharmacists' involvement. For the M/I cause of a shortage, there is a much longer restoration time. The use of MEL classification sets the priority for an efficacious response, especially if combined with local distribution conditions. The reordering model of our pharmacy is being reviewed.

REFERENCE AND/OR ACKNOWLEDGEMENTS

1. *WHO Essential Medicines' List* (March 2017).

No conflict of interest.

2SPD-040 IS PNEUMATIC TUBE DELIVERY SAFE FOR MEDICINES?

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Background Sending drugs by pneumatic tube system is an efficient alternative in large hospital areas, especially in emergency cases. But modern systems are high-speed constructions and this creates high gravitational forces on the products.

Purpose The purpose of our study was to examine the influence on the stability of packaging, various pharmaceutical preparations and active ingredients.

Material and methods G-forces created in the pneumatic tube system were evaluated by accelerometer. Furthermore, variations of temperature were monitored during the transportation process. Different pharmaceutical forms (e.g. powder, ointments, emulsions), packaging materials and loadings were tested under worst-case conditions (mostly remote ward, more than three delivery processes per product). Afterwards the integrity and stability of the products were analysed following pre-defined procedures.

In addition, literature research was performed to identify unstable molecules that may not be sent under these conditions.

Results Our literature research showed that especially protein-based medicines (e.g. antibodies) are characterised by low stability when confronted with physical stress. Therefore, these products were excluded from this study as well as cytotoxic drugs, dangerous goods and compressed-gas containers.

During the conducted 60 rides, temperature stayed within the limit of 15°C–25°C. Maximum g-force measured was 16 g. We detected the following issues:

- Powder or ointments leak from plastic containers;
- Multi–phase formulations tend to separate;
- Powder in ampules are compressed irreversibly into the head of the ampule; and
- Emulsions are destroyed by increasing viscosity.

Conclusion Our results prove that protection of primary packaging is not enough. The influence of strong g-forces on the stability of pharmaceutical preparations and molecules has to be observed. Hospital pharmacists have to bring their knowledge of physical drug stability. However, the analytical