

Development and Impact of a Customized Interactive Therapeutic Drug Monitoring E-Learning Programme (CITE)

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BACKGROUND AND AIM

Therapeutic Drug Monitoring (TDM) combines the knowledge of pharmacokinetics and pharmacodynamics to individualize drug dosing regimens to optimize drug efficacy and minimize adverse effects, especially for certain narrow-therapeutic index drugs. Pharmacists from the KK Women's and Children's Hospital (KKH) Department of Pharmacy routinely perform TDM for hospitalized patients for selected drugs in collaboration with nurses and doctors.

Education and training sessions for different groups of learners (pharmacists, doctors, nurses) on TDM are conducted by pharmacists. The current mode of knowledge delivery involves didactic instructor-led methods. However, issues such as scheduling of manpower and availability of venues for training sessions have led to variable and low attendance and limited accessibility to the sessions.

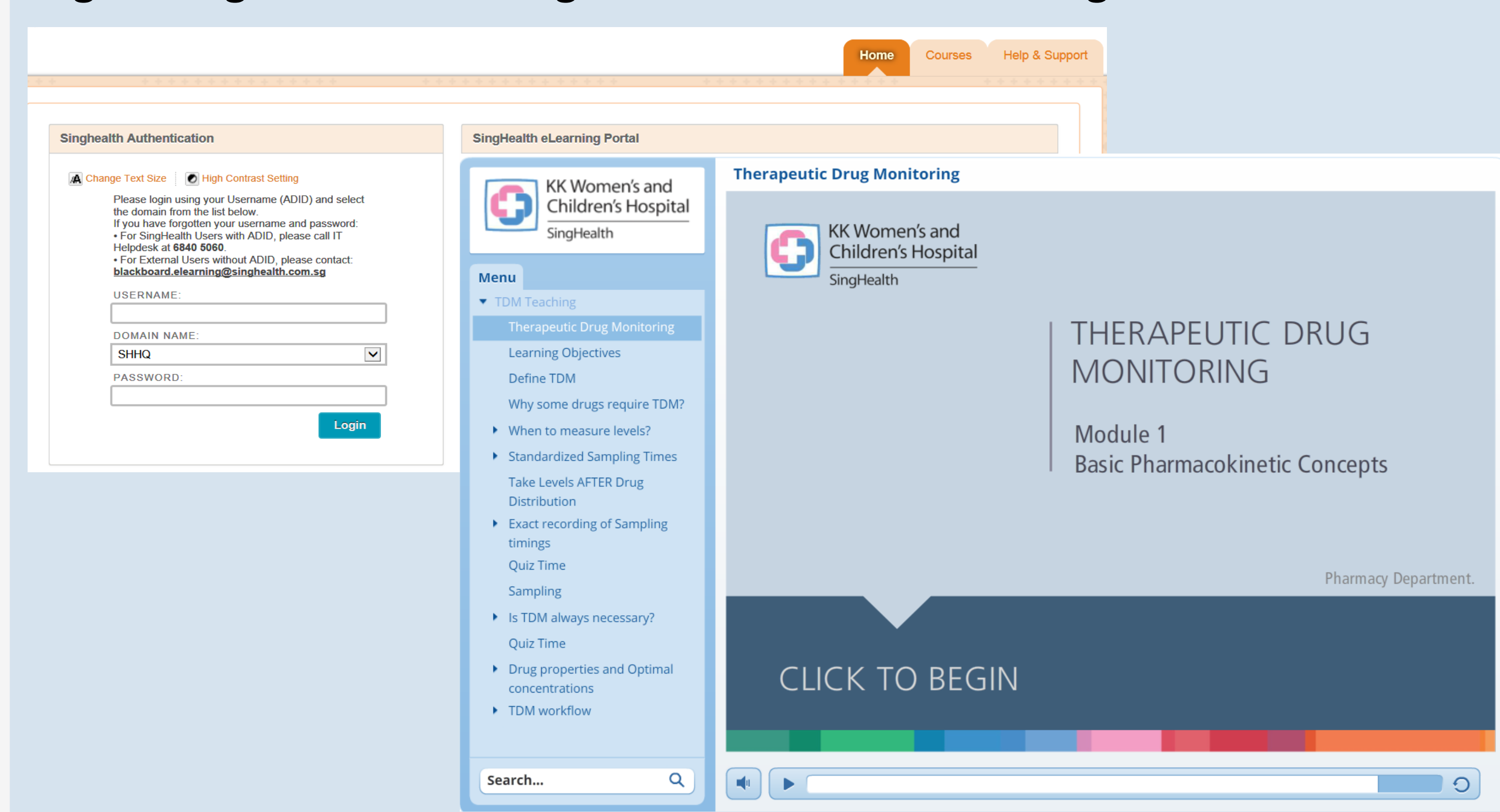
METHODOLOGY

An interactive TDM online learning module was created in the SingHealth eLearning Portal with the aim of improving efficiency in the conduct of this module. This module could be accessed via: <https://blackboard.singhealthacademy.edu.sg>, from any web-based device.

The same didactic lecture contents was made interactive via this platform. Learners were able to have some control over their eLearning experience, as the module includes animation, case scenarios with instant feedback as well as customized audio and video.

A post-quiz consisting of 10 questions (10 points each) was created to assess topic understanding. A survey consisting of 6 statements (Table 1) was sent to learners to evaluate their experience for both teaching styles using a Likert scale ranging from "Strongly Agree" to "Strongly Disagree".

Fig. 1: SingHealth eLearning Portal and TDM e-Learning Module



We sought to evaluate the impact of this methodology of training in terms of 1. Effectiveness (post-quiz scores), 2. Efficiency (learners trained per hour of manpower effort required) and 3. Experience (Likert scale scores on survey statements) between pharmacists, nurses and doctors who have been trained via didactic teaching ("Didactic") versus the online learning platform ("E-Learning"). The time spent for construct of the modules were regarded as a sunk cost and was not included in the analysis.

STATISTICAL ANALYSIS

Continuous variables were compared using T-Test and ordinal variables were compared using Mann Whitney U test where appropriate, and rates were compared using a Poisson's means test. A *p* value was considered statistically significant if *p* < 0.05. All statistical analyses were performed using Excel 2010 and SPSS version 19.

RESULTS AND DISCUSSION

Due to insufficient respondents from nurses and doctors, only pharmacists were included in this analysis. There were 44 pharmacists in the Didactic group and 74 in the E-Learning group.

1. Effectiveness

Mean (standard deviation) scores of "Didactic" vs. "E-Learning" was 84 (15) vs. 93 (9) respectively (*p*=0.253). With a mean difference of 10 points as the null hypothesis, there was no significant difference in scores between the 2 groups. The E-Learning method was as effective as the Didactic style.

2. Efficiency

A total of 3 Didactic teaching sessions (requiring 2 manpower hours each) was conducted for 44 pharmacists (i.e. rate = 7.3 persons per hour). An hour of administrative manpower time was required for enrollment of 74 pharmacists into the module (i.e. rate = 74 persons per hour). There was a significant difference in persons per hour [7.3 (3.4 – 7.1) vs. 74 (12.2 – 30.9), *p*<0.001. More learners were trained in the same amount of time with E-Learning compared to the Didactic style.

3. Experience

There were 23 learners who responded to the following survey statements (Table 1).

Table 1: Comparison of Learners' Experience

Statement	Didactic Mean Rank	E-Learning Mean Rank	P value
1 This method of learning is convenient	15.6	31.9	0.000
2 I am able to focus on learning	22.4	24.7	0.519
3 I am allocated adequate time for learning	19.5	27.5	0.029
4 I am able to understand the topic	22.6	24.4	0.583
5 I am able to revise at my own time	14.2	32.8	0.000
6 This method of learning is effective	19.6	27.4	0.027

The following scores were assigned for the responses: "Strongly Agree"=5; "Agree"=4; "Neutral"=3; "Disagree"=2; "Strongly Disagree"=1

The overall mean rank for E-Learning was higher than the Didactic methodology for all statements. It was significantly higher for statements 1, 3, 5 and 6. The overall experience with E-Learning was more positive compared to the Didactic style.

LIMITATIONS

Only pharmacists were included in this evaluation. We did not evaluate the impact of differences in pharmacists' level of experience. Not all learners completed the survey on experience with the two teaching methodologies.

CONCLUSION

This demonstrates that E-Learning is an equally effective learning method for participants as compared to the Didactic style, while being more efficient as more learners were trained in the same amount of time. In addition, the E-Learning method is more convenient while allowing adequate time for learning and revision. Future studies would include nurses and doctors.

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