# Improvement of Methadone Maintenance Treatment (MMT) Process Through Development and Implementation of Methadone Dispenser

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<td>product design, methadone dispenser, drug addict, Malaysia, Repeatability, Error percentage</td>
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Improvement of Methadone Maintenance Treatment (MMT) Process
Through Development and Implementation of Methadone Dispenser

Nor Amirah Mohd Amran¹,*; Mohd Sayuti Ab Karim¹; Rusdi Abd Rashid²; Tuan Zaharinie Tuan Zahari¹ and Amirul Latif Ishak¹

ABSTRACT

Methadone is a controlled drug and can be prescribed by an authorized person in charge under the direction of medical practitioners for particular patients to cure their addiction towards opioid substances. The development and evaluation of methadone dispenser present a prototype solution for solving current manually methadone dispensing problems which are prone to human error through implementation in methadone maintenance treatment (MMT) program at the same time to increase public awareness about this program. In the current study, the performance of a methadone dispenser is evaluated by investigating the simulation analysis, feasibility and efficiency of the device as compared to manual technique. For testing purposes, methadone syrup was replicated with sugar solution of 66.6g/50ml at 25°C with a dynamic viscosity of 36.680 mPa.s. Thus, it was quantified that time taken to dispense the sugar solution by using methadone dispenser has shown a significant improvement of 81.40 %-time reductions as compared to manual technique. The low repeatability percentage of methadone dispenser by 1.64 % contribute to a high precision device that is reliable to be implemented in MMT program with dispensing accuracy increment of 3.87 % as compared to manual technique. The findings suggest that the methadone

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dispenser is reliable, feasible and contribute to error reduction for implementation in MMT program with approximately of $\approx 97\%$ efficiency.

**Keywords:** Product design, Methadone dispenser, Drug addict, Malaysia, Repeatability, Error percentage

**NOMENCLATURE**

- $S_{ul}$: Yield strength
- $N$: Load
- $\sigma_{TS}$: Tensile strength
- $E_m$: Young’s modulus
- $\nu_m$: Poisson’s ratio
- $\sigma_r$: Standard deviation
- $\bar{x}$: Mean (average) of the weight dispensed
- $x_n$: weight dispensed
- $\sum (x_n - \bar{x})^2$: Sum of the squares of differences between $x_n$ values and mean $\bar{x}$ values
- $n$: Number of runs in the data set

**INTRODUCTION**

Opioid dependence and drug injection are serious world-wide problems. As the global epidemic of heroin use continues, it adds a growing burden, driving the AIDS epidemic in Malaysia and other parts of Asia, with consequent additional health, economic and social problems [1]. Methadone maintenance treatment (MMT), an evidence-based therapy for opioid dependence, has been associated with numerous benefits. In addition to reducing opioid use, it lowers risky
practices and HIV transmission, improves quality of life, and reduces mortality and criminal behavior [2]. Nonetheless, the relapse rates of drug addicted patients in the MMT program are alarmingly high, with rates approaching 90% [3, 4].

“Pharmacy automation” is the process of automating the routine tasks performed in pharmacies [5]. Pharmacists dispense most tablet or syrup prescriptions with a simple tray, spatula, syringe or beaker, which is time-consuming. Hence, automation is a good solution to speed up the process [5]. Enabled by innovations in technology, the complexity of medical devices is rapidly increasing [6]. Dispensing medication is the core function of pharmaceutical care. Traditionally, dispensing medication is the core function of pharmaceutical care which involve an unequivocally complex process shown in Fig. 1 under pharmacist supervision [7]. Errors can arise at any stage during the dispensing process. Therefore, it is essential to ensure the dependability of these devices, as some errors may go undetected and cause serious patient harm and occasionally death [6-8]. Medication error (ME) is among the most common types of medical errors involving a substantial number of individuals and accounting for a sizable increase in healthcare costs that may cause or lead to inappropriate medication use or patient harm which is also potentially injurious or fatal [9, 10]. An existing study of non-fatal overdoses in Malaysia strongly predicted future fatal overdoses at an estimated 3 to 4 deaths resulting from every 100 overdoses, which indicates a high risk of death from overdosing [11]. A number of studies from around the world suggest that approximately 10% of patients admitted to hospital suffer some kind of harm from hospital procedure errors [12]. However, less information is reported on dispensing device development for MMT practice.

Fig. 1 Standard dispensing process in community and hospital pharmacies [7]
The most common factors contributing to MEs are staff shortage or high workload, doctor or pharmacist distraction, incorrect prescription chart interpretation, lack of knowledge and lack of experience. However, MEs usually arise from poorly designed work environments and systems rather than the individual performance of a single practitioner [10]. Some studies also point out that the liquid dosage form is more prone to administration error than the solid dosage form due to measurement errors that may occur while measuring the volume required for liquid doses, which are known as “wrong doses” [7, 10]. Errors during medicine preparation could happen in the pharmacy, for example when the pharmacist prepares an incorrect dilution for an oral syrup due to wrong technique or wrong diluents. Dispensing errors happen when the medication dispensed/delivered by the pharmacy is not compatible with the prescription order written by the doctor. Types of dispensing error are labelling error, wrong dose, dose duplication, wrong dosage form and wrong patient [7, 10].

Many programs, including the current MMT program, have noted a substantial increase in patient volume with decreased reimbursements and therefore, reduced staffing and higher caseloads. The dramatic increase in dependence has led to treatment needs that exceed the current system [13]. Thus, there is a clear need to expand the reach and variety of therapeutic interventions available, especially for those pharmacists who still practice the manual dispensing technique, which is prone to human error. Technological interventions provide a means of extending the scarce treatment resources available; however, their feasibility and efficiency must be demonstrated.

In this research paper, an innovative approach is proposed to improve efficiency, maximize pharmacist workflow productivity, reduce the occupational hazard of carpal tunnel syndrome and minimize dispensing errors by applying a methadone dispenser in the MMT program. This paper
presents a prototype solution design as well as its application and certain experimental results for solving current dispensing process problems. Methadone dispensers presently available in the industry are costly, complex and difficult to handle in terms of design and fabrication. The end result of the proposed approach is the accurate, although not exact, prediction of device performance.

The current study was designed to evaluate the feasibility and initial efficiency of a methadone dispenser for pharmacists to use with opioid-dependent patients receiving MMT and who are continuing to use illicit drugs. The machine design allows the user to dispense methadone syrup hands-free with zero risk of contamination in two simple steps: (1) insert the peristaltic pump tube into the methadone bottle and (2) key in the filling time and filling speed to dispense. Therefore, the main stages in carrying out this project are mechanical modelling, finite element analysis, viscosity analysis, and prototype performance evaluation by testing in normal lab condition and compared with manual technique.

METHODOLOGY

The project flow schedule is illustrated in Fig. 2. The project flow chart was set up to suit the development and performance evaluation of a methadone dispenser and at the same time to evaluate the feasibility and efficiency of this machine in assuring product functionality.

Fig. 1 Flowchart of the study

2.1 Prototype Concept and Design

The prototype was built to automate the process of dispensing and delivering methadone syrup by using a cup for the dispensing slot. Fig. 3 shows a schematic diagram of the mechanical and electrical prototype components.
Fig. 2 Schematic diagram of prototype mechanical and electrical components

SolidWorks software was employed to provide a 3D model of the methadone dispenser as shown in Fig. 4. The dispenser designed to deliver methadone syrup in predetermined prescribed amounts comprises: housing; a dispensing slot (cup) placed integrally in the housing and adapted to dispense methadone syrup automatically and in a controlled manner; a storage tank within the said housing, adapted to communicate with the dispensing portion and to contain the methadone syrup to be dispensed; a peristaltic pump mechanism for displacing methadone syrup from the storage tank in the housing to the dispensing slot (cup) in the housing; a microcontroller configured to communicate with the dispensing slot (cup) and to receive and process data associated with a patient’s dosage keyed in from the control panel. The processor was configured with the dispensing slot (cup) to facilitate automated and controlled dispensing of methadone syrup.

Fig. 3 (a) Orthographic view, (b) Isometric view of 3D methadone dispenser model for finite element analysis and fabrication purposes

2.2 Product Testing Setup

The feasibility and efficiency of the methadone dispenser were tested in normal lab condition to evaluate the prototype’s performance in the methadone dispensing process. The prototype’s performance was evaluated using a viscosity test, product test, error percentage and repeatability analysis. First, an SVM 3000 Stabinger viscometer was used to determine the viscosity of methadone HCl -- Aseptone syrup (5 mg/1 ml) for sugar duplication with the same viscosity for testing purposes since methadone syrup is a controlled drug and can be used by authorized person only. The duplicated sugar solution was then used to test the device by dispensing the syrup from the lowest dose of 5 mg to the highest dose of 250 mg. The device was
set up to have a constant waiting time of 10 s with variable filling time and filling speed depending on the dose dispensed. The error percentage was calculated using the sugar solution with the standard methadone dose commonly used in clinical practice, which is 104 mg for 100 runs. The device was set up with a constant waiting time of 10 s, filling time of 2.0 s and filling speed of 27 m/s. The result obtained was then integrated into the repeatability analysis to estimate the actual weight that the methadone dispenser can repeatedly dispense for 100 runs in comparison with manual technique as shown in Fig. 5.

Fig. 4 Current manual practice to dispense the methadone syrup

RESULT AND DISCUSSION

3.1 Finite Element Structural Analysis

Modeling and simulation of device designs is emerging among medical device manufacturers as a technique in improving product quality by helping designers to detect defects that may be overlooked during the design process [6]. The methadone dispenser is designed by using SolidWorks software according to the specification as per requirement. In order to visualise the performance of machine structure, the finite element structural analysis is used to determine the Von Mises stress and resultant displacement of the methadone dispenser. The material properties of methadone dispenser are shown in Table 1. The following static structural analysis shown in Table 2 for the methadone dispenser in SolidWorks simulation show how a model or object shown in Fig. 6 will respond to the load applied on the dispenser as the temporary placement for record keeping process or any related methadone items.
Table 1 Material properties of the methadone dispenser design

<table>
<thead>
<tr>
<th>Material</th>
<th>316L Stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield strength ($S_{yt}$)</td>
<td>170 MPa</td>
</tr>
<tr>
<td>Tensile strength ($\sigma_{TS}$)</td>
<td>485 MPa</td>
</tr>
<tr>
<td>Young’s modulus ($E_m$)</td>
<td>$200 \times 10^3$ MPa</td>
</tr>
<tr>
<td>Poisson’s ratio ($\nu_m$)</td>
<td>0.265</td>
</tr>
<tr>
<td>Applied load (N)</td>
<td>30, 700 and 28570.75</td>
</tr>
</tbody>
</table>

Table 2 Von Mises stress and resultant displacement of the methadone dispenser

<table>
<thead>
<tr>
<th>Load (N)</th>
<th>Von Mises stresses (MPa)</th>
<th>Resultant Displacement (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>0.179</td>
</tr>
<tr>
<td>700</td>
<td>0</td>
<td>4.165</td>
</tr>
<tr>
<td>28570.75</td>
<td>0</td>
<td>170.000</td>
</tr>
</tbody>
</table>

Fig. 5 Finite element model of the methadone dispenser of Von Mises stress (a), (b), (c) and resultant displacement (d), (e), (f) to ensure the toughness of the machine structure

From the data analysis shown in Table 2, the higher the force applied to the methadone dispenser, the higher the Von Mises stress and resultant displacement act to the dispenser. In this analysis, it is found that design failure will be occurred when the applied load is higher than 28,570.75 N which is far higher and it rarely could be happened.
3.2 Prototype Performance Evaluation

Three sets of tests are conducted to verify the functionality of the methadone dispenser: viscosity test, error percentage of performance test and repeatability analysis. The final prototype of the methadone dispenser shown in Fig. 7 is tested in normal lab environment by using the sugar solution as a duplication of methadone syrup with the same viscosity as methadone is a controlled drug which illegal to possess without a prescription, or to supply or produce without a licence. As illustrated in Fig. 8 shows the methadone dispenser keypad controller which comprising: a filling time setting means variable time taken for the device to dispense the prescribed dosage of methadone syrup; a waiting time setting means a constant time of 10 s is used throughout the dispensing process for the replacement of filled cup to empty cup at the dispensing slot; a counter setting means the total number of cups dispense by using the device and can be reset to zero; a filling speed setting means variable of dispensing rate that can be increased or decreased depending on the prescription dose to be dispensed; a flushing setting means a withdrawal of residual methadone syrup left in the tube at the end of the dispensing process.

Fig. 6 Final prototype of the methadone dispenser

Fig. 7 Methadone dispenser keypad controller

3.2.1 Viscosity Test and Performance Evaluation

Table 3 shows the dynamic viscosity of the both solutions tested by using SVM 3000 Stabinger Viscometer. The substitutes for methadone syrup can be in liquids that contain carbohydrates as adjuvants such that sucrose is used to increase the viscosity in methadone syrup preparations [14, 15]. It is well reported that, the sucrose standard solutions (1mg/ml) were prepared by dissolving 10 mg of the respective sugar in 10 ml of distilled water [14]. However, in
pharmaceutical practice, the range of 1.2-1.4 g/ml was generally used. Hence for this project, the concentration 1.2-1.4 g/ml of sugar solution was produced for methadone liquid duplication purposed. Therefore, the sugar standards solution used is 66.6 g dissolved into 50 ml of distilled water. To obtain the same dynamic viscosity of methadone syrup which is 37.286 mPa.s, the final concentration of sugar solution at 25°C a dynamic temperature for methadone is averagely obtained by 66.6g/50ml with the dynamic viscosity of 36.680 mPa.s. The sugar solution then is used for methadone dispenser performance evaluation and the results are shown in Fig. 9. As illustrated in Fig. 9 (a), as the filling time (s) and filling speed (m/s) increased, then the weight dispensed (mg) will also increase which is linear and directly proportional to each other. Based on Fig. 9 (b) and Fig. 9 (c), the closer the value of $R^2$ which are 0.993 and 0.998 to 1.000, the better the quality of the fit. Thus, in this case we can conclude that the results obtained are very accurate as they fit almost perfectly to the line of best fit.

Table 3 Methadone duplication by using sugar solution at various temperature

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>20</th>
<th>22</th>
<th>25</th>
<th>37</th>
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</thead>
<tbody>
<tr>
<td>Methadone, 5mg/ml</td>
<td>44.733</td>
<td>41.451</td>
<td>37.286</td>
<td>29.211</td>
</tr>
<tr>
<td>Sugar solution, 66.6g/50ml</td>
<td>48.651</td>
<td>43.115</td>
<td>36.680</td>
<td>30.899</td>
</tr>
</tbody>
</table>

Fig. 8 Performance evaluation of methadone dispenser by using Minitab for (a) 3D wireframe plot, (b) regression plot for weight dispensed (mg) vs filling time (s) and (c) regression plot for weight dispensed (mg) vs filling speed (m/s)
3.2.2 Error Percentage

Then, to calculate the error percentage of the methadone dispenser, the machine is tested by dispensing the sugar solution of 80 mg, doses of methadone commonly used in clinical practice [16, 17]. Dozens of studies since then have demonstrated that dosing in the range of 80 to 120 milligrams of methadone per day resulted in superior treatment outcomes, such as better retention of patients in treatment and less illicit drug use. It also concluded that patients receiving at least 80 mg or more methadone per day was associated with best results to prevent re-injecting behavior [1, 17]. The test is done for 100 runs with the dispensing process comparison of manual technique and by using methadone dispenser. The result obtained are shown in Fig. 10 and Fig. 11 with comparison of time taken and weight of methadone dispensed at 104 mg since the concentration used for methadone duplication for sugar solution 1.2-1.4 g/ml. Meanwhile, the percentage of error is defined as formula Eq. 1 obtained is below than 10% which is the error is negligible. The effectiveness and uncertainties of the device output is specified by the repeatability period [18, 19]. Repeatability is an important concept to assess the accuracy and consistency of measurements. It expresses the proportion of the total variation that is reproducible among repeated measurements of the same subject or group within short intervals of time [20, 21]. The repeatability formula is defined as Eq. 2 shown below which provide an estimation of how repeatable a test is at specific concentrations.

Fig. 9 Time taken (s) to dispense 104 mg of sugar solution for 100 runs (n)

Fig. 10 Weight of sugar solution dispensed (mg) for 100 runs (n) at 104 mg
\[ \text{Error} \% = \left( \frac{\text{Theoretical value} - \text{Experimental value}}{\text{Theoretical value}} \right) \times 100 \]  

(1)

\[ \text{Standard deviation} \ (\sigma_r) = \sqrt{\frac{\sum(x_n - \bar{x})^2}{n - 1}} \]  

(2)

Where, \( \bar{x} \) = mean (average) of the weight dispensed

\( x_n \) = weight dispensed

\( \sum(x_n - \bar{x})^2 \) = sum of the squares of differences between \( x_n \) values and the mean \( \bar{x} \)

\( n \) = the number of runs in the data set

\text{Manual technique} \ (\sigma_r):

\[ \sigma_r = \sqrt{\frac{\sum(x_n - \bar{x})^2}{n - 1}} = \sqrt{\frac{\sum(x_n - 108.564)^2}{100 - 1}} \]

= 1.266

\text{Methadone dispenser} \ (\sigma_r):

\[ \sigma_r = \sqrt{\frac{\sum(x_n - \bar{x})^2}{n - 1}} = \sqrt{\frac{\sum(x_n - 104.367)^2}{100 - 1}} \]

= 1.246

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Table 4 Comparison of manual technique and methadone dispenser tested to dispense 104 mg (theoretical value) of sugar solution for 100 runs

<table>
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<th>Techniques</th>
<th>Manual</th>
<th>Methadone Dispenser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (s)</td>
<td>$10.429 \leq \text{time} \leq 11.143$</td>
<td>Constant $= 2$</td>
</tr>
<tr>
<td></td>
<td>Average time $= 10.764$</td>
<td></td>
</tr>
<tr>
<td>Weight Dispensed (mg)</td>
<td>$104.592 \leq \text{weight} \leq 111.033$</td>
<td>$101.530 \leq \text{weight} \leq 106.971$</td>
</tr>
<tr>
<td>Percentage of Error (%)</td>
<td>$0.569 \leq \text{error %} \leq 6.763$</td>
<td>$2.375 \leq \text{error %} \leq 2.856$</td>
</tr>
<tr>
<td>$n$</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>$\bar{x}$</td>
<td>108.564</td>
<td>104.367</td>
</tr>
<tr>
<td>$\sum (x_n - \bar{x})^2$</td>
<td>158.647</td>
<td>153.820</td>
</tr>
<tr>
<td>Repeatability ($\sigma_r$)</td>
<td>1.266</td>
<td>1.246</td>
</tr>
<tr>
<td>Percentage of Repeatability (%)</td>
<td>5.03</td>
<td>1.64</td>
</tr>
</tbody>
</table>

Remarks

- Time taken to dispense the sugar solution improved by 81.40 % by using methadone dispenser.
- Accuracy shows an increment by 3.87 % from manual technique to methadone dispenser.

Table 4 present the information by technique of methadone dispensing reveals that lower percentage of repeatability correspond to better technique of methadone dispensing which is by using methadone dispenser. Methadone dispenser shows a significantly low percentage of 1.64 %
providing higher chances for the dispenser to repeatedly dispense the acquired weight with lower percentage of error compared to the manually dispense technique that is prone to human error. Thus, the value quantified are reliable and consistent across the testing as the value of standard deviation is low, then the value of imprecision is also low. Although the safe use of medication devices can improve and save the lives of millions, errors in the use of these substances can lead to equally significant consequences because most of the underlying causes of errors can be attributed to a lack of awareness [10].

Fig. 10 and Fig. 11 illustrate the differences between manual technique and by using methadone dispenser in time taken to dispense sugar solution of 104 mg for 100 runs. Over the period of the 100 runs, it can be seen that the methadone dispenser dispensed the sugar solution at a constant time taken of 2 s with consistent weight dispensed of approximately 104.367 mg. However, it can be observed that the graph is slightly varied with the average time taken of 10.764 s while the weight dispensed shows slightly surged with averagely 108.563 mg to manually dispense the sugar solution. It presents a significant improvement of time taken with approximately 81.40 % in dispensing the sugar solution while the improvement for the accuracy of weight dispensed in comparison between manual and automated technique is increasing approximately by 3.87 %. The range of the weight dispensed by using methadone dispenser is $101.530 \leq \text{weight dispensed} \leq 106.971$ with $2.375 \% \leq \text{error percentage} \leq 2.856 \%$ while the weight range to manually dispense the sugar solution is $104.592 \leq \text{weight dispensed} \leq 111.033$ with $0.569 \% \leq \text{error percentage} \leq 6.763 \%$. The range of weight dispensed is within the acceptance limit permitted by the methadone dispensing regulation which is $\pm 1.0 \text{ ml}$. Hence, the overall accuracy percentage of this methadone dispenser is averagely around 97 % thus allows it to be fully utilized in assisting the pharmacist during the dispensing process and this device is viable to be implemented in the
methadone treatment program. These flaws provide an opportunity for further iterate on the design by improving the dispensing accuracy and efficiency as it needs to be close to perfection to minimize losses and effectively reduce pharmacists’ workloads.

CONCLUSION

The present work has elaborated the development and performance evaluation of manual technique in comparison with methadone dispenser which has fully satisfied the purposes of the study that can be concluded as follows:

- The replication of methadone syrup by using sugar solution is obtained at 66.6g/50ml at 25°C with the dynamic viscosity of 36.680 mPa.s.
- The time consuming of current manually practice can be reduced to 81.40 % which shows a significant improvement by using methadone dispenser.
- The accuracy percentage shows an increment of 3.87 % by using methadone dispenser as compared to manual technique thus contribute to the feasibility and error reduction of the device in assisting pharmacist in MMT program.
- As the filling time (s) and filling speed (m/s) increased, then the weight dispensed (mg) will also increase and linear to each other as they fit almost perfectly to the line of best fit with approximately of ≈ 97 % efficiency of methadone dispenser.
- The repeatability analysis shows the lower percentage of repeatability compared to manual technique thus will contribute to the high precision of the methadone dispenser which is reliable to be implemented in MMT program.
ACKNOWLEDGMENT

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REFERENCES


Fig. 1 Standard dispensing process in community and hospital pharmacies [7]

80x33mm (300 x 300 DPI)
Fig. 2 Flowchart of the study

55x58mm (300 x 300 DPI)

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Literature review regarding the methadone dispenser

3D CAD model of the methadone dispenser according to the device schematic diagram layout.

Finite element structural analysis by SolidWorks simulation:
- Material properties of the methadone dispenser
  - Material: 316L stainless steel
  - Yield strength ($S_y$): 170 MPa
- Applied loads (N): 30, 700 and 28570.75

Product fabrication and assembly based on the schematic diagram of the methadone dispenser

Product testing for manual technique and methadone dispenser feasibility and efficiency of prototype performance evaluation:
- Viscosity test and prototype performance evaluation with dispensed weight of 5 mg to 250 mg
- Error percentage and repeatability analysis with weight dispensed of 104 mg for 100 runs

Within spec?

Yes

No

Modification

Project completion
Fig. 3 Schematic diagram of prototype mechanical and electrical components

39x43mm (300 x 300 DPI)
Fig. 4 (a) Orthographic view, (b) Isometric view of 3D methadone dispenser model for finite element analysis and fabrication purposes

45x44mm (300 x 300 DPI)
Fig. 5 Current manual practice to dispense the methadone syrup

38 x 21 mm (300 x 300 DPI)
Fig. 6 Finite element model of the methadone dispenser of Von Mises stress (a), (b), (c) and resultant displacement (d), (e), (f) to ensure the toughness of the machine structure

46x32mm (300 x 300 DPI)
Fig. 7 Final prototype of the methadone dispenser

33x36mm (300 x 300 DPI)
Fig. 8 Methadone dispenser keypad controller

53x30mm (300 x 300 DPI)
Fig. 9 Performance evaluation of methadone dispenser by using Minitab for (a) 3D wireframe plot, (b) regression plot for weight dispensed (mg) vs filling time (s) and (c) regression plot for weight dispensed (mg) vs filling speed (m/s)

41x82mm (300 x 300 DPI)
Fig. 10 Time taken (s) to dispense 104 mg of sugar solution for 100 runs (n)

75x46mm (300 x 300 DPI)
Weight of sugar solution dispensed (mg) for 100 runs (n) at 104 mg

Fig. 11 Weight of sugar solution dispensed (mg) for 100 runs (n) at 104 mg

75x46mm (300 x 300 DPI)