FORECASTING DRUG DEMAND USING THE SINGLE MOVING AVERAGE 3 PERIODE AT UGM ACADEMIC HOSPITAL

Ade Puspitasari¹, Satibi², Endang Yuniarti³, Taufiqurohman⁴

¹Master of Pharmacy Management, Faculty of Pharmacy, Gadjah Mada University, Indonesia
²Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmacy, Gadjah Mada University, Indonesia
³Pharmacy Installation, PKU Muhammadiyah Hospital Yogyakarta, Indonesia
⁴Pharmacy Installation, Gadjah Mada University Academic Hospital, Yogyakarta, Indonesia

satibi@ugm.ac.id

https://doi.org/10.31603/pharmacy.v8i3.7130

ABSTRACT

Drug management at the Academic Hospital of Gadjah Mada University found that the damaged and expired drugs amounted to 4.71% and the dead stock was 7.89%. One of the influential factors to contribute to the considerable amount of damaged and expired drugs and dead stock is inaccurate planning. Forecasting is one aspect of planning, which helps predict the upcoming event as a way to make planning more effective and efficient. One of the forecasting methods is the 3-period Single Moving Average (SMA). This study aims to forecast drug demand in January 2021 at the Academic Hospital of Gadjah Mada and to see the size of the error using the 3-period SMA method. This is an observational study with a retrospective descriptive analysis. The research population is all drugs used at the Academic Hospital of Gadjah Mada in January 2018-December 2020. The samples are the top 5 most used drugs based on A category resulted from the ABC analysis of consumption in 2020 with certain criteria using purposive sampling technique. The drug demand was forecasted using Eviews 12 software and its error size, particularly the Mean Absolute Percentage Error (MAPE) was calculated using Microsoft Excel. The results showed that the forecast of drug demand in January 2021 was Tutofusin Ops 500ml 496pcs, Hemapo 2000 IU/ml 290pcs, Hemapo 3000 IU/ml 219pcs, Abilify Discmelt 10mg 717pcs, and Otsu-NS Piggyback 3736pcs. The calculated MAPE value was 8.32%, which means that the 3 period SMA forecasting is acceptable and reasonable for further application at the Academic Hospital of Gadjah Mada.

Keywords: Forecasting; Single Moving Average; MAPE

1. INTRODUCTION

Hospitals need planning to ensure that the stock of drugs accord with the right type, be available on time, be in the right amount, and become efficient. Planning is intended to avoid stockouts using accountable methods and basic planning, such as consumption method, epidemiological method, a combination of consumption and epidemiological methods and in accordance with the existing budget (Kementerian Kesehatan RI, 2016). Previous researches revealed that many hospitals are lacking of appropriate planning and controlling inventory. Consequently, this leads to some problems, including drug vacancies, excessive stock, expired drugs and damaged drugs (Kementerian Kesehatan RI, 2019).

A research at RSU Haji Surabaya found that stagnant and stockout of drugs had an impact on soaring costs, and considerable losses for the hospital (Mellen & Pudjirahardjo, 2013). A number of stagnant drugs will take up space and can increase storage costs (Dewi et al., 2020). One of the planning indicators is the percentage of expired or damaged drugs. The large percentage of expired drug illustrates inaccurate planning and/or poor quality observation in storage, and/or changes in prescribing patterns or existing disease patterns (Satibi, 2016).
A research by Taufiqurohman et al. (2021), which was conducted at the Pharmacy Installation of the Academic Hospital of Gadjah Mada University (RSA UGM) on May 1-October 31 2019 found that the percentage of damaged and expired drugs was 4.71% and the percentage of dead stock was 7.89%. In fact, this finding exceeds the acceptable standard percentage of damaged and expired drugs of 0-0.25%, while the standard percentage of dead stock is 0% (Pudjaningsih, 1996). Dead stock refers to drug supplies in the inventory that is never used or purchased in 3 consecutive months. Dead stock is attributed to some factors, including inaccurate planning, lack of doctor commitment, and lack of officers’ understanding on the effect of dead stock (Akbar, 2016). This situation allows RSA UGM to require an appropriate and effective forecasting methods for planning because according to Satibi (2016), forecasting is an attempt to predict and estimate future conditions, as well as minimize deviations.

Accurate drug supply planning is essential in overcoming problems related to drug availability. The ups and downs of drug demand that occur every year become a separate problem for the warehouse team in planning the procurement based on demand. The occurrence of drug shortages certainly leads to sudden orders, which results in higher purchase prices. In addition, the incidence of drug shortages will put health services at risk (clinical impact) and cause numerous problems for hospitals (Dewi et al., 2020). Forecasting techniques are needed to help estimate future drug demands (Akbar, 2016).

There are various forecasting methods, but the most commonly used is the time series method. This method is based on the assumption that the pattern of past demand serve as good indicators for the future (Zahra, 2020). There are several time series methods, including SMA, single exponential smoothing (SES), BOX-JENKINS and there are other methods (Lumy, 2012). The SMA method uses actual data from the previous period to generate forecasting scores in the future. This method is characterized by the requirement for historical data for a certain period of time in forecasting the upcoming demand. The longer the period of historical data used, the more visible the smoothing effect in the forecast, resulting in a smoother moving average (Arsyad, 2009). This study referred to data that did not contain any element of trend or seasonal factors. The advantages of this method are ease of calculation and simplicity (Irawan et al., 2021). Currently, a number of softwares can be directly used for ease of forecasting, one of which is Eviews 12. The formula for the moving average equation is written as follows:

\[ F_t = \frac{(Y_{t-1} + Y_{t-2} + \ldots + Y_{t-n})}{n} \]

Where

- \( F_t \): forecast score in period t
- \( Y_{t-1} + Y_{t-2} + \ldots + Y_{t-n} \): the amount of data for the previous n periods
- \( n \): number of periods in the moving average

The accuracy of the forecasting method is determined by looking at the size of the error. Almost all error measures are resulted from the average of some functions of the difference between the true value and the forecast score. One measure of error that is often used is the Mean Absolute Percentage Error (MAPE).

MAPE is calculated by finding the absolute error of each period, then dividing it by the true value in that particular period, and finally averaging the percentage. MAPE is sometimes considered more useful in calculating forecasting errors when compared to its absolute value (Lumy, 2012). A smaller error value indicates a better forecasting method.

SMA forecasting aims to eliminate or reduce randomness in the time series (Arsyad, 2009). In the 3 period SMA forecasting method, the forecast for a month is resulted from the average of the previous 3 months (Subagyo, 2000). On this basis, this research aimed to conduct a 3-period high school forecasting simulation at the pharmacy installation of RSA UGM. This study resulted in MAPE values as a description resulted from the application of SMA 3 Periods.
2. METHOD

This is a retrospective descriptive analysis study, which aims to determine the forecast score for drug demand in January 2021 at the UGM RSA and calculate the error size of the 3 period SMA method. The research population in this quantitative study is all data on drug use at the Pharmacy Installation of RSA UGM in January 2018-December 2020. The research samples referred to data on the use of the top 5 most used types of drugs based on A category, resulted from ABC analysis of consumption in 2020 with inclusion and exclusion criteria. The inclusion criteria were drugs that were included in A category in 2018, 2019, 2020, while the exclusion criteria were drugs with incomplete drug use history for 36 months. The samples were selected using purposive technique derived from retrospective data on drug use in January 2018-December 2020. This study used the Annual Medical Material Sales report file as the research instrument. The report used the 2018-2020 report, which contains the name of the drug, the price of the drug, and the amount of use. The data from instrument were analyzed using Eviews12 and Microsoft Excel.

This research began with determining the research samples. The samples were determined based on the results of the ABC analysis of the annual medical material sales report file (downloaded from the Management Information System of RSA UGM). Reports on sales of medical materials (or drug use data) for 2018, 2019 and 2020, were analyzed by ABC, respectively. Category A drug items in 2020 were then listed in the top 5 most used drugs and according to the inclusion and exclusion criteria were used as research samples. Category A was for drugs which made up 20-30% of the total items and spent 75-80% of funds. Category B referred to drug classification which accounted for 25% of the total item and used 15-20% of funds. Category C was drugs which made up 50% of the total item and spent 5-10% of funds. The five samples were tested for forecasting using the 3 period SMA method using Eviews 12 software. Afterwards, the forecast results and real data were used to calculate the MAPE error size using Excel with formula 4.

Forecasting test was done by opening Eviews 12 and opening a new workfile by clicking create a new Eviews workfile. In this study, Workfile structure type used to determine the data structure was dated (determine time series data). The data specification was selected monthly because it used monthly data. Start date was filled with the initial period of data, and end date was filled with the end period of data + period to be predicted, before it was clicked Ok. The drug usage file was entered per item.xls in the workfile by File>import>import form file>Finish. Data were presented in Excel form for ease of use rather than manual input. Forecasting tests using 3-period SMA was conducted by selecting Quick>Generate Series, and the Enter Equation column would appear to write the formula for the SMA method. The formula for the 3-period SMA was movav3=@movav(sum,3). @movav (abbreviated from moving average) and it was in brackets, which means that the degenerate variable is a variable with the number and 3 periods. The step was considered successful if a new file appeared in the workfile, namely movav3 as the result of forecasting. movav3 data in the first 2 periods would appear as Not Available (NA), since the value that appeared first was the average result from period 1 to 3 of the actual data and was the forecasting result for period 4. The results of movav3 were then entered into Excel table to calculate its MAPE. In subsequence, MAPE results were interpreted to see the applicability of the forecasting method. MAPE calculation can systematically be formulated as equation (2). The resulted MAPE score was then interpreted according to Table 1.

<table>
<thead>
<tr>
<th>MAPE (%)</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>Forecasting is very accurate</td>
</tr>
<tr>
<td>10-20</td>
<td>Good fortune telling</td>
</tr>
<tr>
<td>20-50</td>
<td>Reasonable forecast</td>
</tr>
<tr>
<td>&gt;50</td>
<td>Inaccurate forecast</td>
</tr>
</tbody>
</table>

Source : Lewis (1982) in (Moreno et al., 2013)
MAPE = \( \frac{\sum_{t=1}^{n} |A_t - F_t|}{A_t} \times 100\% \)  

(2)

### 3. RESULTS AND DISCUSSION

This study used data on drug use at the RSA UGM in January 2018 - December 2020 with movement data. The data on drug use were taken from the annual sales report file of medical materials, which contained data on drug names, drug prices, and the amount of drug use taken/downloaded from the Management Information System of RSA UGM. The top five types of category A drugs that were selected as samples were Tutofusin Ops 500ml, Hemapo 2000 IU/ml, Hemapo 3000 IU/ml, Abilify Discmelt 10mg tab, and Otsu-NS Piggyback.

MAPE was calculated by finding the absolute error of each period to be divided by the true value for that period, and finally averaging this absolute percentage. This approach is very useful when the size of the forecasting variable is an important factor in evaluating the accuracy of the forecast. MAPE is more intuitive and easy to interpret than other error measures (Adhikari & Agrawal, 2013).

#### Table 2. Tutofusin Ops 500ml Forecasting Results and Error Size with 3 Period SMA Method

<table>
<thead>
<tr>
<th>Month</th>
<th>Real Number</th>
<th>Number of Forecasting per Month (pcs)</th>
<th>Deviation (pcs)</th>
<th>Absolute Deviation (pcs)</th>
<th>[Absolute Deviation]²</th>
<th>MAPE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>696</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Feb-18</td>
<td>413</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mar-18</td>
<td>605</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apr-18</td>
<td>540</td>
<td>571</td>
<td>-31</td>
<td>31</td>
<td>982</td>
<td>6</td>
</tr>
<tr>
<td>May-18</td>
<td>643</td>
<td>519</td>
<td>124</td>
<td>124</td>
<td>15293</td>
<td>19</td>
</tr>
<tr>
<td>Jun-18</td>
<td>446</td>
<td>596</td>
<td>-150</td>
<td>150</td>
<td>22500</td>
<td>34</td>
</tr>
<tr>
<td>Jul-18</td>
<td>374</td>
<td>543</td>
<td>-169</td>
<td>169</td>
<td>28561</td>
<td>45</td>
</tr>
<tr>
<td>Aug-18</td>
<td>485</td>
<td>488</td>
<td>-3</td>
<td>3</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Sep-18</td>
<td>346</td>
<td>435</td>
<td>-89</td>
<td>89</td>
<td>7921</td>
<td>26</td>
</tr>
<tr>
<td>Oct-18</td>
<td>235</td>
<td>402</td>
<td>-167</td>
<td>167</td>
<td>27778</td>
<td>71</td>
</tr>
<tr>
<td>Nov-18</td>
<td>362</td>
<td>355</td>
<td>7</td>
<td>7</td>
<td>44</td>
<td>2</td>
</tr>
<tr>
<td>Dec-18</td>
<td>674</td>
<td>314</td>
<td>360</td>
<td>360</td>
<td>129360</td>
<td>53</td>
</tr>
<tr>
<td>Jan-19</td>
<td>739</td>
<td>424</td>
<td>315</td>
<td>315</td>
<td>99435</td>
<td>43</td>
</tr>
<tr>
<td>Feb-19</td>
<td>822</td>
<td>592</td>
<td>230</td>
<td>230</td>
<td>53053</td>
<td>28</td>
</tr>
<tr>
<td>Mar-19</td>
<td>543</td>
<td>745</td>
<td>-202</td>
<td>202</td>
<td>40804</td>
<td>37</td>
</tr>
<tr>
<td>Apr-19</td>
<td>679</td>
<td>701</td>
<td>-22</td>
<td>22</td>
<td>499</td>
<td>3</td>
</tr>
<tr>
<td>May-19</td>
<td>783</td>
<td>681</td>
<td>102</td>
<td>102</td>
<td>10336</td>
<td>13</td>
</tr>
<tr>
<td>Jun-19</td>
<td>418</td>
<td>668</td>
<td>-250</td>
<td>250</td>
<td>62667</td>
<td>60</td>
</tr>
<tr>
<td>Jul-19</td>
<td>427</td>
<td>627</td>
<td>-200</td>
<td>200</td>
<td>39867</td>
<td>47</td>
</tr>
<tr>
<td>Aug-19</td>
<td>423</td>
<td>543</td>
<td>-120</td>
<td>120</td>
<td>14320</td>
<td>28</td>
</tr>
<tr>
<td>Sep-19</td>
<td>432</td>
<td>423</td>
<td>9</td>
<td>9</td>
<td>87</td>
<td>2</td>
</tr>
<tr>
<td>Oct-19</td>
<td>373</td>
<td>427</td>
<td>-54</td>
<td>54</td>
<td>2952</td>
<td>15</td>
</tr>
<tr>
<td>Nov-19</td>
<td>325</td>
<td>409</td>
<td>-84</td>
<td>84</td>
<td>7112</td>
<td>26</td>
</tr>
<tr>
<td>Dec-19</td>
<td>394</td>
<td>377</td>
<td>17</td>
<td>17</td>
<td>300</td>
<td>4</td>
</tr>
<tr>
<td>Jan-20</td>
<td>637</td>
<td>364</td>
<td>273</td>
<td>273</td>
<td>74529</td>
<td>43</td>
</tr>
<tr>
<td>Feb-20</td>
<td>650</td>
<td>452</td>
<td>198</td>
<td>198</td>
<td>39204</td>
<td>30</td>
</tr>
<tr>
<td>Mar-20</td>
<td>597</td>
<td>560</td>
<td>37</td>
<td>37</td>
<td>1344</td>
<td>6</td>
</tr>
<tr>
<td>Apr-20</td>
<td>548</td>
<td>628</td>
<td>-80</td>
<td>80</td>
<td>6400</td>
<td>15</td>
</tr>
<tr>
<td>May-20</td>
<td>779</td>
<td>598</td>
<td>181</td>
<td>181</td>
<td>32640</td>
<td>23</td>
</tr>
<tr>
<td>Jun-20</td>
<td>628</td>
<td>641</td>
<td>-13</td>
<td>13</td>
<td>178</td>
<td>2</td>
</tr>
<tr>
<td>Jul-20</td>
<td>591</td>
<td>652</td>
<td>-61</td>
<td>61</td>
<td>3680</td>
<td>10</td>
</tr>
<tr>
<td>Aug-20</td>
<td>374</td>
<td>666</td>
<td>-292</td>
<td>292</td>
<td>85264</td>
<td>78</td>
</tr>
<tr>
<td>Sep-20</td>
<td>403</td>
<td>531</td>
<td>-128</td>
<td>128</td>
<td>16384</td>
<td>32</td>
</tr>
<tr>
<td>Oct-20</td>
<td>516</td>
<td>456</td>
<td>60</td>
<td>60</td>
<td>3600</td>
<td>12</td>
</tr>
<tr>
<td>Nov-20</td>
<td>477</td>
<td>431</td>
<td>46</td>
<td>46</td>
<td>2116</td>
<td>10</td>
</tr>
<tr>
<td>Dec-20</td>
<td>496</td>
<td>465</td>
<td>31</td>
<td>31</td>
<td>940</td>
<td>6</td>
</tr>
<tr>
<td>Jan-21</td>
<td>496</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Primary Data
The first three months in Table 2 did not contain the number of forecasting needs because the 3 period SMA method used the data of previous 3 months to predict the next period, in this case was the fourth month. The results of the forecasting were then entered in formula (2) using Excel table to obtain the MAPE score. Table 2 shows that the forecasting score for the demand for Tutofusin Ops 500ml for the 3 period SMA method in January 2021 was 496pcs with an average MAPE score of 25%. The MAPE score in the 20-50% range means that the 3 period SMA forecast for Tutofusin is in the reasonable category. The accuracy value was 75%, resulted from 100% reduced by the MAPE score.

The resulted MAPE score was not in line with the result of forecasting sales of Aknil products (paracetamol + ibuprofen) of PT. Sunthi, which produced an MAPE score of 52.23%. This result indicates that the forecast is inaccurate (Moreno et al., 2013). Another study that produced a large MAPE score was conducted in Blang Bintang Village using the SMA method, which obtained a forecasting rate of 43.43% and stated that the method was low, reasonable, and acceptable (Rais et al., 2020).

Table 3. Hemapo 2000 IU/ml Forecasting Results and Error Size with 3 Period SMA Method

<table>
<thead>
<tr>
<th>Month</th>
<th>Real Number</th>
<th>Number of Forecasting per Month (pcs)</th>
<th>Deviation (pcs)</th>
<th>Absolute Deviation (pcs)</th>
<th>[Absolute Deviation]²</th>
<th>MAPE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>272</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Feb-18</td>
<td>242</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mar-18</td>
<td>250</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apr-18</td>
<td>268</td>
<td>255</td>
<td>13</td>
<td>13</td>
<td>178</td>
<td>5</td>
</tr>
<tr>
<td>May-18</td>
<td>252</td>
<td>253</td>
<td>-1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Jun-18</td>
<td>234</td>
<td>257</td>
<td>-23</td>
<td>23</td>
<td>514</td>
<td>10</td>
</tr>
<tr>
<td>Jul-18</td>
<td>245</td>
<td>251</td>
<td>-6</td>
<td>6</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Aug-18</td>
<td>272</td>
<td>244</td>
<td>28</td>
<td>28</td>
<td>803</td>
<td>10</td>
</tr>
<tr>
<td>Sep-18</td>
<td>289</td>
<td>250</td>
<td>39</td>
<td>39</td>
<td>1495</td>
<td>13</td>
</tr>
<tr>
<td>Oct-18</td>
<td>286</td>
<td>269</td>
<td>17</td>
<td>17</td>
<td>300</td>
<td>6</td>
</tr>
<tr>
<td>Nov-18</td>
<td>298</td>
<td>282</td>
<td>16</td>
<td>16</td>
<td>245</td>
<td>5</td>
</tr>
<tr>
<td>Dec-18</td>
<td>285</td>
<td>291</td>
<td>-6</td>
<td>6</td>
<td>36</td>
<td>2</td>
</tr>
<tr>
<td>Jan-19</td>
<td>217</td>
<td>290</td>
<td>-73</td>
<td>73</td>
<td>5280</td>
<td>33</td>
</tr>
<tr>
<td>Feb-19</td>
<td>241</td>
<td>267</td>
<td>-26</td>
<td>26</td>
<td>659</td>
<td>11</td>
</tr>
<tr>
<td>Mar-19</td>
<td>254</td>
<td>248</td>
<td>6</td>
<td>6</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>Apr-19</td>
<td>230</td>
<td>237</td>
<td>-7</td>
<td>7</td>
<td>54</td>
<td>3</td>
</tr>
<tr>
<td>May-19</td>
<td>274</td>
<td>242</td>
<td>32</td>
<td>32</td>
<td>1045</td>
<td>12</td>
</tr>
<tr>
<td>Jun-19</td>
<td>256</td>
<td>253</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Jul-19</td>
<td>296</td>
<td>253</td>
<td>43</td>
<td>43</td>
<td>1820</td>
<td>14</td>
</tr>
<tr>
<td>Aug-19</td>
<td>315</td>
<td>275</td>
<td>40</td>
<td>40</td>
<td>1573</td>
<td>13</td>
</tr>
<tr>
<td>Sep-19</td>
<td>265</td>
<td>289</td>
<td>-24</td>
<td>24</td>
<td>576</td>
<td>9</td>
</tr>
<tr>
<td>Oct-19</td>
<td>324</td>
<td>292</td>
<td>32</td>
<td>32</td>
<td>1024</td>
<td>10</td>
</tr>
<tr>
<td>Nov-19</td>
<td>297</td>
<td>301</td>
<td>-4</td>
<td>4</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>Dec-19</td>
<td>322</td>
<td>295</td>
<td>27</td>
<td>27</td>
<td>711</td>
<td>8</td>
</tr>
<tr>
<td>Jan-20</td>
<td>272</td>
<td>314</td>
<td>-42</td>
<td>42</td>
<td>1792</td>
<td>16</td>
</tr>
<tr>
<td>Feb-20</td>
<td>242</td>
<td>297</td>
<td>-55</td>
<td>55</td>
<td>3025</td>
<td>23</td>
</tr>
<tr>
<td>Mar-20</td>
<td>250</td>
<td>279</td>
<td>-29</td>
<td>29</td>
<td>822</td>
<td>11</td>
</tr>
<tr>
<td>Apr-20</td>
<td>268</td>
<td>255</td>
<td>13</td>
<td>13</td>
<td>178</td>
<td>5</td>
</tr>
<tr>
<td>May-20</td>
<td>252</td>
<td>253</td>
<td>-1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Jun-20</td>
<td>234</td>
<td>257</td>
<td>-23</td>
<td>23</td>
<td>514</td>
<td>10</td>
</tr>
<tr>
<td>Jul-20</td>
<td>245</td>
<td>251</td>
<td>-6</td>
<td>6</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Aug-20</td>
<td>272</td>
<td>244</td>
<td>28</td>
<td>28</td>
<td>803</td>
<td>10</td>
</tr>
<tr>
<td>Sep-20</td>
<td>289</td>
<td>250</td>
<td>39</td>
<td>39</td>
<td>1495</td>
<td>13</td>
</tr>
<tr>
<td>Oct-20</td>
<td>286</td>
<td>269</td>
<td>17</td>
<td>17</td>
<td>300</td>
<td>6</td>
</tr>
<tr>
<td>Nov-20</td>
<td>298</td>
<td>282</td>
<td>16</td>
<td>16</td>
<td>245</td>
<td>5</td>
</tr>
<tr>
<td>Dec-20</td>
<td>285</td>
<td>291</td>
<td>-6</td>
<td>6</td>
<td>36</td>
<td>2</td>
</tr>
<tr>
<td>Jan-21</td>
<td></td>
<td>290</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data
Table 3 shows that the results of Hemapo 2000 IU/ml SMA method for 3 periods in January 2021 will require 290pcs. The results of calculations using the formula (2) MAPE an average of 8%. The MAPE value means that the 3-period SMA forecast for Hemapo 2000IU/ml is very accurate with an accuracy of 91%. These results are in line with research that predicts order demand at ACK Fried Chicken, the results show that the SMA method is very accurate because it has the smallest error rate of MAPE <10% (Hudaningsih et al., 2020). Another suitable research is the Manurung (2020) study which produces a forecast score with a MAPE score of 5.96%.

Table 4 shows that the Hemapo 3000 IU/ml forecasting for the 3 period SMA method in January 2021 would require 219 pcs with an average MAPE calculation result of 22%. The MAPE score was in the 20-50% range, which means the 3 period SMA forecast for Hemapo 3000 IU/ml category is reasonable or good enough.

Table 4. Forecasting Results of Hemapo 3000 IU/ml and Size of Error with 3 Periods SMA Method

<table>
<thead>
<tr>
<th>Month</th>
<th>Real Number</th>
<th>Number of Forecasting per Month (pcs)</th>
<th>Deviation (pcs)</th>
<th>Absolute Deviation (pcs)</th>
<th>[Absolute Deviation]^2</th>
<th>MAPE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>122</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Feb-18</td>
<td>66</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mar-18</td>
<td>98</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apr-18</td>
<td>108</td>
<td>95</td>
<td>13</td>
<td>13</td>
<td>160</td>
<td>12</td>
</tr>
<tr>
<td>May-18</td>
<td>104</td>
<td>91</td>
<td>13</td>
<td>13</td>
<td>178</td>
<td>13</td>
</tr>
<tr>
<td>Jun-18</td>
<td>90</td>
<td>103</td>
<td>-13</td>
<td>13</td>
<td>178</td>
<td>15</td>
</tr>
<tr>
<td>Jul-18</td>
<td>83</td>
<td>101</td>
<td>-18</td>
<td>18</td>
<td>312</td>
<td>21</td>
</tr>
<tr>
<td>Aug-18</td>
<td>77</td>
<td>92</td>
<td>-15</td>
<td>15</td>
<td>235</td>
<td>20</td>
</tr>
<tr>
<td>Sep-18</td>
<td>79</td>
<td>83</td>
<td>-4</td>
<td>4</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Oct-18</td>
<td>80</td>
<td>80</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nov-18</td>
<td>63</td>
<td>79</td>
<td>-16</td>
<td>16</td>
<td>245</td>
<td>25</td>
</tr>
<tr>
<td>Dec-18</td>
<td>103</td>
<td>74</td>
<td>29</td>
<td>29</td>
<td>841</td>
<td>28</td>
</tr>
<tr>
<td>Jan-19</td>
<td>135</td>
<td>82</td>
<td>53</td>
<td>53</td>
<td>2809</td>
<td>39</td>
</tr>
<tr>
<td>Feb-19</td>
<td>79</td>
<td>100</td>
<td>-21</td>
<td>21</td>
<td>455</td>
<td>27</td>
</tr>
<tr>
<td>Mar-19</td>
<td>63</td>
<td>106</td>
<td>-43</td>
<td>43</td>
<td>1820</td>
<td>68</td>
</tr>
<tr>
<td>Apr-19</td>
<td>62</td>
<td>92</td>
<td>-30</td>
<td>30</td>
<td>920</td>
<td>49</td>
</tr>
<tr>
<td>May-19</td>
<td>72</td>
<td>68</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>Jun-19</td>
<td>81</td>
<td>66</td>
<td>15</td>
<td>15</td>
<td>235</td>
<td>19</td>
</tr>
<tr>
<td>Jul-19</td>
<td>84</td>
<td>72</td>
<td>12</td>
<td>12</td>
<td>152</td>
<td>15</td>
</tr>
<tr>
<td>Aug-19</td>
<td>72</td>
<td>79</td>
<td>-7</td>
<td>7</td>
<td>49</td>
<td>10</td>
</tr>
<tr>
<td>Sep-19</td>
<td>45</td>
<td>79</td>
<td>-34</td>
<td>34</td>
<td>1156</td>
<td>76</td>
</tr>
<tr>
<td>Oct-19</td>
<td>99</td>
<td>67</td>
<td>32</td>
<td>32</td>
<td>1024</td>
<td>32</td>
</tr>
<tr>
<td>Nov-19</td>
<td>94</td>
<td>72</td>
<td>22</td>
<td>22</td>
<td>484</td>
<td>23</td>
</tr>
<tr>
<td>Dec-19</td>
<td>129</td>
<td>79</td>
<td>50</td>
<td>50</td>
<td>2467</td>
<td>39</td>
</tr>
<tr>
<td>Jan-20</td>
<td>162</td>
<td>107</td>
<td>55</td>
<td>55</td>
<td>2988</td>
<td>34</td>
</tr>
<tr>
<td>Feb-20</td>
<td>191</td>
<td>128</td>
<td>63</td>
<td>63</td>
<td>3927</td>
<td>33</td>
</tr>
<tr>
<td>Mar-20</td>
<td>198</td>
<td>161</td>
<td>37</td>
<td>37</td>
<td>1394</td>
<td>19</td>
</tr>
<tr>
<td>Apr-20</td>
<td>201</td>
<td>184</td>
<td>17</td>
<td>17</td>
<td>300</td>
<td>9</td>
</tr>
<tr>
<td>May-20</td>
<td>180</td>
<td>197</td>
<td>-17</td>
<td>17</td>
<td>278</td>
<td>9</td>
</tr>
<tr>
<td>Jun-20</td>
<td>187</td>
<td>193</td>
<td>-6</td>
<td>6</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>Jul-20</td>
<td>168</td>
<td>189</td>
<td>-21</td>
<td>21</td>
<td>455</td>
<td>13</td>
</tr>
<tr>
<td>Aug-20</td>
<td>181</td>
<td>178</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Sep-20</td>
<td>178</td>
<td>179</td>
<td>-1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oct-20</td>
<td>215</td>
<td>176</td>
<td>39</td>
<td>39</td>
<td>1547</td>
<td>18</td>
</tr>
<tr>
<td>Nov-20</td>
<td>228</td>
<td>191</td>
<td>37</td>
<td>37</td>
<td>1344</td>
<td>16</td>
</tr>
<tr>
<td>Dec-20</td>
<td>213</td>
<td>207</td>
<td>6</td>
<td>6</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>Jan-21</td>
<td>219</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data

Table 5 presents that the forecasting of Abilify Discmelt 10mg tab with the 3 period SMA method in January 2021 would require 717pcs with the resulted MAPE average score of 18%.
This means that the 3 period SMA forecasting for Abilify Discmelt is in good category with an accuracy value 82%.

Table 5. Forecasting Results of Abilify Discmelt 10 mg and Size of Error with 3 Periods SMA Method

<table>
<thead>
<tr>
<th>Month</th>
<th>Real Number</th>
<th>Number of Forecasting per Month (pcs)</th>
<th>Deviation (pcs)</th>
<th>Absolute Deviation (pcs)</th>
<th>[Absolute Deviation]²</th>
<th>MAPE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Feb-18</td>
<td>159</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mar-18</td>
<td>271</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apr-18</td>
<td>265</td>
<td>193</td>
<td>72</td>
<td>72</td>
<td>5136</td>
<td>27</td>
</tr>
<tr>
<td>May-18</td>
<td>327</td>
<td>232</td>
<td>95</td>
<td>95</td>
<td>9088</td>
<td>29</td>
</tr>
<tr>
<td>Jun-18</td>
<td>360</td>
<td>288</td>
<td>72</td>
<td>72</td>
<td>5232</td>
<td>20</td>
</tr>
<tr>
<td>Jul-18</td>
<td>433</td>
<td>317</td>
<td>116</td>
<td>116</td>
<td>13379</td>
<td>27</td>
</tr>
<tr>
<td>Aug-18</td>
<td>406</td>
<td>373</td>
<td>33</td>
<td>33</td>
<td>1067</td>
<td>8</td>
</tr>
<tr>
<td>Sep-18</td>
<td>493</td>
<td>400</td>
<td>93</td>
<td>93</td>
<td>8711</td>
<td>19</td>
</tr>
<tr>
<td>Oct-18</td>
<td>395</td>
<td>444</td>
<td>-49</td>
<td>49</td>
<td>2401</td>
<td>12</td>
</tr>
<tr>
<td>Nov-18</td>
<td>619</td>
<td>431</td>
<td>188</td>
<td>188</td>
<td>35219</td>
<td>30</td>
</tr>
<tr>
<td>Dec-18</td>
<td>623</td>
<td>502</td>
<td>121</td>
<td>121</td>
<td>14560</td>
<td>19</td>
</tr>
<tr>
<td>Jan-19</td>
<td>472</td>
<td>546</td>
<td>-74</td>
<td>74</td>
<td>5427</td>
<td>16</td>
</tr>
<tr>
<td>Feb-19</td>
<td>440</td>
<td>571</td>
<td>-131</td>
<td>131</td>
<td>17248</td>
<td>30</td>
</tr>
<tr>
<td>Mar-19</td>
<td>560</td>
<td>512</td>
<td>48</td>
<td>48</td>
<td>2336</td>
<td>9</td>
</tr>
<tr>
<td>Apr-19</td>
<td>667</td>
<td>491</td>
<td>176</td>
<td>176</td>
<td>31093</td>
<td>26</td>
</tr>
<tr>
<td>May-19</td>
<td>722</td>
<td>556</td>
<td>166</td>
<td>166</td>
<td>27667</td>
<td>23</td>
</tr>
<tr>
<td>Jun-19</td>
<td>532</td>
<td>650</td>
<td>-118</td>
<td>118</td>
<td>13845</td>
<td>22</td>
</tr>
<tr>
<td>Jul-19</td>
<td>749</td>
<td>640</td>
<td>109</td>
<td>109</td>
<td>11808</td>
<td>15</td>
</tr>
<tr>
<td>Aug-19</td>
<td>716</td>
<td>668</td>
<td>48</td>
<td>48</td>
<td>2336</td>
<td>7</td>
</tr>
<tr>
<td>Sep-19</td>
<td>674</td>
<td>666</td>
<td>8</td>
<td>8</td>
<td>69</td>
<td>1</td>
</tr>
<tr>
<td>Oct-19</td>
<td>875</td>
<td>713</td>
<td>162</td>
<td>162</td>
<td>26244</td>
<td>19</td>
</tr>
<tr>
<td>Nov-19</td>
<td>919</td>
<td>755</td>
<td>164</td>
<td>164</td>
<td>26896</td>
<td>18</td>
</tr>
<tr>
<td>Dec-19</td>
<td>1007</td>
<td>823</td>
<td>184</td>
<td>184</td>
<td>33979</td>
<td>18</td>
</tr>
<tr>
<td>Jan-20</td>
<td>834</td>
<td>934</td>
<td>-100</td>
<td>100</td>
<td>9933</td>
<td>12</td>
</tr>
<tr>
<td>Feb-20</td>
<td>811</td>
<td>920</td>
<td>-109</td>
<td>109</td>
<td>11881</td>
<td>13</td>
</tr>
<tr>
<td>Mar-20</td>
<td>871</td>
<td>884</td>
<td>-13</td>
<td>13</td>
<td>169</td>
<td>1</td>
</tr>
<tr>
<td>Apr-20</td>
<td>708</td>
<td>839</td>
<td>-131</td>
<td>131</td>
<td>17074</td>
<td>18</td>
</tr>
<tr>
<td>May-20</td>
<td>523</td>
<td>797</td>
<td>-274</td>
<td>274</td>
<td>74893</td>
<td>52</td>
</tr>
<tr>
<td>Jun-20</td>
<td>598</td>
<td>701</td>
<td>-103</td>
<td>103</td>
<td>10540</td>
<td>17</td>
</tr>
<tr>
<td>Jul-20</td>
<td>474</td>
<td>610</td>
<td>-136</td>
<td>136</td>
<td>18405</td>
<td>29</td>
</tr>
<tr>
<td>Aug-20</td>
<td>638</td>
<td>532</td>
<td>106</td>
<td>106</td>
<td>11307</td>
<td>17</td>
</tr>
<tr>
<td>Sep-20</td>
<td>650</td>
<td>570</td>
<td>80</td>
<td>80</td>
<td>6400</td>
<td>12</td>
</tr>
<tr>
<td>Oct-20</td>
<td>696</td>
<td>587</td>
<td>109</td>
<td>109</td>
<td>11808</td>
<td>16</td>
</tr>
<tr>
<td>Nov-20</td>
<td>734</td>
<td>661</td>
<td>73</td>
<td>73</td>
<td>5280</td>
<td>10</td>
</tr>
<tr>
<td>Dec-20</td>
<td>720</td>
<td>693</td>
<td>27</td>
<td>27</td>
<td>711</td>
<td>4</td>
</tr>
<tr>
<td>Jan-21</td>
<td></td>
<td>717</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data

Table 6 pinpoints that the forecasting of Otsu-NS Piggyback using the 3 period SMA method in January 2021 would require 3736 pcs with an average MAPE score of 17%, which means that the 3 period SMA forecast for Otsu-NS Piggyback is in good category.

From this study, it is obvious that forecasting using the 3 period SMA method makes it easier to determine drug demands in the following period. This result is in accordance with the conclusion of Andriana’s research, which stated that the forecasting using SMA made it easier to determine the amount of production of each tea flavor variant, so as to avoid excess or shortage of stock. In addition to using the result of the forecast in the process of determining the number
of products to produce, it is also necessary to pay attention to data on remaining stocks in the warehouse from the previous month ([Rusdiana et al., 2020]).

Forecasting using the 3 period SMA method for the top 5 most used types of drug A category at RSA UGM for the 2018-2020 period indicates that the MAPE score varies by <50%. Thus, it highlights that the method is reasonable and still acceptable. Various MAPE scores are possible because the 3 period SMA method has several weaknesses, including the need for sufficient historical data, the same weight of the data in each year, and unavailability of random data, which did not result in a good forecast ([Irawan et al., 2021]).

Table 6. Otsu-NS Piggyback Forecasting Results and Error Size with 3 Period SMA Method with 3 Period SMA Method

<table>
<thead>
<tr>
<th>Month</th>
<th>Real Number</th>
<th>Number of Forecasting per Month (pcs)</th>
<th>Deviation (pcs)</th>
<th>Absolute Deviation (pcs)</th>
<th>[Absolute Deviation]^2</th>
<th>MAPE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-18</td>
<td>1243</td>
<td>1242</td>
<td>121</td>
<td>121</td>
<td>14641</td>
<td>9</td>
</tr>
<tr>
<td>Feb-18</td>
<td>1192</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mar-18</td>
<td>1291</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apr-18</td>
<td>1363</td>
<td>1242</td>
<td>121</td>
<td>121</td>
<td>14641</td>
<td>9</td>
</tr>
<tr>
<td>May-18</td>
<td>1223</td>
<td>1282</td>
<td>-59</td>
<td>59</td>
<td>3481</td>
<td>5</td>
</tr>
<tr>
<td>Jun-18</td>
<td>959</td>
<td>1292</td>
<td>-333</td>
<td>333</td>
<td>111111</td>
<td>35</td>
</tr>
<tr>
<td>Jul-18</td>
<td>1359</td>
<td>1182</td>
<td>177</td>
<td>177</td>
<td>31447</td>
<td>13</td>
</tr>
<tr>
<td>Aug-18</td>
<td>1091</td>
<td>1180</td>
<td>-89</td>
<td>89</td>
<td>7980</td>
<td>8</td>
</tr>
<tr>
<td>Sep-18</td>
<td>1069</td>
<td>1136</td>
<td>-67</td>
<td>67</td>
<td>4534</td>
<td>6</td>
</tr>
<tr>
<td>Oct-18</td>
<td>999</td>
<td>1173</td>
<td>-174</td>
<td>174</td>
<td>30276</td>
<td>17</td>
</tr>
<tr>
<td>Nov-18</td>
<td>888</td>
<td>1053</td>
<td>-165</td>
<td>165</td>
<td>27225</td>
<td>19</td>
</tr>
<tr>
<td>Dec-18</td>
<td>1200</td>
<td>985</td>
<td>215</td>
<td>215</td>
<td>46082</td>
<td>18</td>
</tr>
<tr>
<td>Jan-19</td>
<td>1297</td>
<td>1029</td>
<td>268</td>
<td>268</td>
<td>71824</td>
<td>21</td>
</tr>
<tr>
<td>Feb-19</td>
<td>991</td>
<td>1128</td>
<td>-137</td>
<td>137</td>
<td>18860</td>
<td>14</td>
</tr>
<tr>
<td>Mar-19</td>
<td>1016</td>
<td>1163</td>
<td>-147</td>
<td>147</td>
<td>21511</td>
<td>14</td>
</tr>
<tr>
<td>Apr-19</td>
<td>1168</td>
<td>1101</td>
<td>67</td>
<td>67</td>
<td>4444</td>
<td>6</td>
</tr>
<tr>
<td>May-19</td>
<td>1059</td>
<td>1058</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jun-19</td>
<td>924</td>
<td>1081</td>
<td>-157</td>
<td>157</td>
<td>24649</td>
<td>17</td>
</tr>
<tr>
<td>Jul-19</td>
<td>1305</td>
<td>1050</td>
<td>255</td>
<td>255</td>
<td>64855</td>
<td>20</td>
</tr>
<tr>
<td>Aug-19</td>
<td>970</td>
<td>1096</td>
<td>-126</td>
<td>126</td>
<td>15876</td>
<td>13</td>
</tr>
<tr>
<td>Sep-19</td>
<td>1136</td>
<td>1066</td>
<td>70</td>
<td>70</td>
<td>4853</td>
<td>6</td>
</tr>
<tr>
<td>Oct-19</td>
<td>1225</td>
<td>1137</td>
<td>88</td>
<td>88</td>
<td>7744</td>
<td>7</td>
</tr>
<tr>
<td>Nov-19</td>
<td>937</td>
<td>1110</td>
<td>-173</td>
<td>173</td>
<td>30044</td>
<td>18</td>
</tr>
<tr>
<td>Dec-19</td>
<td>1379</td>
<td>1099</td>
<td>280</td>
<td>280</td>
<td>78213</td>
<td>20</td>
</tr>
<tr>
<td>Jan-20</td>
<td>1852</td>
<td>1180</td>
<td>672</td>
<td>672</td>
<td>451136</td>
<td>36</td>
</tr>
<tr>
<td>Feb-20</td>
<td>1749</td>
<td>1389</td>
<td>360</td>
<td>360</td>
<td>129360</td>
<td>21</td>
</tr>
<tr>
<td>Mar-20</td>
<td>1682</td>
<td>1660</td>
<td>22</td>
<td>22</td>
<td>484</td>
<td>1</td>
</tr>
<tr>
<td>Apr-20</td>
<td>1325</td>
<td>1761</td>
<td>-436</td>
<td>436</td>
<td>190096</td>
<td>33</td>
</tr>
<tr>
<td>May-20</td>
<td>1470</td>
<td>1585</td>
<td>-115</td>
<td>115</td>
<td>13302</td>
<td>8</td>
</tr>
<tr>
<td>Jun-20</td>
<td>1239</td>
<td>1492</td>
<td>-253</td>
<td>253</td>
<td>64178</td>
<td>20</td>
</tr>
<tr>
<td>Jul-20</td>
<td>1813</td>
<td>1345</td>
<td>468</td>
<td>468</td>
<td>219336</td>
<td>26</td>
</tr>
<tr>
<td>Aug-20</td>
<td>1504</td>
<td>1507</td>
<td>-3</td>
<td>3</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Sep-20</td>
<td>2490</td>
<td>1519</td>
<td>971</td>
<td>971</td>
<td>943488</td>
<td>39</td>
</tr>
<tr>
<td>Oct-20</td>
<td>2905</td>
<td>1936</td>
<td>969</td>
<td>969</td>
<td>939607</td>
<td>33</td>
</tr>
<tr>
<td>Nov-20</td>
<td>3199</td>
<td>2300</td>
<td>899</td>
<td>899</td>
<td>808800</td>
<td>28</td>
</tr>
<tr>
<td>Dec-20</td>
<td>5103</td>
<td>2865</td>
<td>2238</td>
<td>2238</td>
<td>5010136</td>
<td>44</td>
</tr>
<tr>
<td>Jan-21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3736</td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data

4. CONCLUSION

The data collection and processing revealed that the total drug demand for the January 2021 period for the five sample drugs were as follows: Tutofusin Ops 500ml (496pcs), Hemapo 2000 IU/ml (290pcs), Hemapo 3000 IU/ml (219pcs), Abilify Discmelt 10mg tab (717) pcs, and Otsu-NS Piggyback (3736 pcs). The MAPE scores of the five drugs varied by <50%. Thus, it can be concluded that the 3 period SMA method is acceptable and reasonable to assist the planning for
drug demand in the pharmaceutical installation of RSA UGM, especially to help predict drug demand for the next period.

The limitations of this study are the changing patterns of drug prescription and drug use policies in hospitals that affect drug use data, which often contribute to fluctuating data. It is thus advised to forecast on other drug items and to apply forecasting methods into the Hospital Management Information System as a way to help and facilitate the planning team in planning the drug demand of the next period.

5. ACKNOWLEDGEMENT
A grateful acknowledgement is extended to the Academic Hospital of Gadjah Mada University and all those contributing to this research.

6. CONFLICT OF INTEREST
The author declares that there are no competing conflicts of interest.

7. REFERENCES


