Author/s:
Leung, CHS;Chong, C;Lim, WK

Title:
Medical student-led patient education prior to hospital discharge improves 1-month adherence rates

Date:
2017-03-01

Citation:
Leung, C. H. S., Chong, C. & Lim, W. K. (2017). Medical student-led patient education prior to hospital discharge improves 1-month adherence rates. Internal Medicine Journal, 47 (3), pp.328-332. https://doi.org/10.1111/imj.13365.

Persistent Link:
https://hdl.handle.net/11343/292584

## TYPE: BRIEF COMMUNICATIONS

**TITLE:**

**Medical Student Led Patient Education Prior to Hospital Discharge Improves One-Month Adherence Rates**

**ABSTRACT:**

Approximately 40% of patients are non-adherent to their medications. A prospective study of 80 patients evaluated the effectiveness of medical student led pre-discharge medication education sessions. A significantly greater proportion of patients in the intervention group were adherent to their regular medications at one month compared with the control group (76.3% compared to 60.3%, *P*=0.037). Medical student led patient education significantly improved medication adherence rates.

(Word count 65)

Key words: Medication, education, adherence, Medical student, discharge,

**AUTHORS & INSTITUTIONS:**

1st Authors' names: Chun Him Shelton **Leung**
Authors' affiliation(s):
Department of Medicine, Ballarat Health Services, Ballarat, Victoria
Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Parkville, Victoria
Corresponding author full contact details:
Name: Dr Chun Him Shelton Leung
Address: 1 Drummond St N, Ballarat VIC
Post code: 3350
City: Ballarat
Country: Australia
Fax:
Email: shelton.lch@gmail.com

2nd Authors' names: Carol Chong
Authors' affiliation(s): Department of Aged Care, Northern Hospital, Epping, Victoria
Corresponding author full contact details:
Name: Carol Chong
Address: 185 Cooper St, Epping VIC
Post code: 3076
City: Epping
Country: Australia

Fax:
Email: Carol.Chong@nh.org.au

3rd Authors' names: Wen Kwang Lim
Authors' affiliation(s):
Department of Aged Care, Northern Hospital, Epping, Victoria
Department of Aged Care, Royal Melbourne Hospital, Parkville, Victoria
Corresponding author full contact details:
Name: Wen Kwang Lim
Address: 185 Cooper St, Epping VIC
Post code: 3076
City: Epping
Country: Australia
Fax:
Email: Kwang.Lim@nh.org.au

Medication adherence has been described as the 'key mediator between medical practice and patient outcomes' because it can reduce hospital readmissions, improve clinical outcomes and prevent exacerbation of diseases [1-4]. Studies have shown that 30-60% of patients are not adherent to medications prescribed by doctors [3, 5-8]. There are few studies in Australia evaluating the effectiveness of an intervention to improve adherence rates. Furthermore, medical student led intervention is unique. This study is an extension of a previous study, which revealed that 39.7% of patients were not adherent to their medications 1 month after discharge from hospital [8]. The aim was to assess the effectiveness of introducing a pre-discharge medication education session led by a medical student which included providing a written take home daily medication plan to improve adherence rates.

This prospective interventional study compared medication adherence rates between patients who received the intervention and compared it to a study with similar demography but without the intervention [8]. A sample size of 81 patients (For each sample group) was determined in order to generate result with a desired power of 0.80, alpha level of 0.05 and an expected difference of adherence rate of 20 percent. This study was approved by the Northern Health Low Risk Ethics Committee in November 2014.

Participants were recruited from general medical wards at The Northern Hospital, Victoria before discharge from hospital. Potential participants were identified by the ward pharmacists who notified the researcher through a paging system. All recruited patients (or their caregivers) received a 10-20 minutes face-to-face standardised education session from a medical student including a verbal explanation of the correct way of administrating the medications and re-writing the patients' full list of medications into breakfast, lunch, dinner and bedtime format for patients to take home. The indications for all medications were verbally explained to patients and written down at patients' request. Exclusion criteria were patients discharged to a residential care facility, transferred to subacute units, patients ≤ 18 years of age, patients using a Webster-Pak dosage system, primary person managing the medications could not speak English and/or had hearing or speech problems.

To measure adherence rates, patients' discharge medication regimens were compared to self-reported medication regimens obtained via telephone call 30-40 days after discharge. All adherence data from follow up refers only to regular medications. Non-adherence was defined as any intentional or unintentional medication change(s) made by patients including medications type, dosage, frequency, time and method of administration without the instruction from a healthcare professional.

Comprehensive statistical analysis was performed using SPSS (v12; IBM, Somers, NY, USA) and Microsoft Excel 2011 v14.2. Normality was tested for all continuous data using the Shapiro-Wilk test. Pearson's chi-squared test was used to compare the adherence rates between groups. The demographic similarities between the two groups of patients were compared using Student's t-tests, Mann-Whitney U Tests and Pearson's chi-squared tests where appropriate. Binary logistic regression was used to model the predictors of adherence rates in the intervention group to determine the odds ratio and probabilities of each variable. Variables with a p-value of <0.2 in the univariate analysis were then used in the multivariate logistic regression model. Estimated odds ratios and 95% confidence internals (95% CI) were reported. All two-tailed statistical significance was defined as $p < 0.05$.

A total of 135 patients were potential recruits of which 90 consented to participate in the study, 6 declined to participate and 39 were excluded; Webster-pak (n=13), transfer to nursing home (n=8), non-English speaking background (n=6), hearing or speech difficulty (n=2), missed (n=10). During follow up, ten patients were further excluded from the study due to death (n=4), being in hospital during the time of contact (n=2), moved overseas (n=1) and unable to be contacted (n=3). The average time to follow up was 38 (32-43) days. Eighty completed the study, 42 (52.5%) were male. The median age of participants was 70 (56-80) years and the average hospital length of stay was 3 (2-5) days.

For the primary outcome of medication adherence, a significant greater proportion of intervention patients were adherent to their medications compared with the control group (76.3% compared to 60.3%, p=0.037). Patients' characteristics between the two groups were mostly similar (table 1). However, 2 significant differences found in the control group were that a carer helped with medication management more (32.4% compared to 16.3%, p=0.022) and hospital length of stay was significantly longer (5(4-9) compared to 3(2-5), p<0.001) compared to the intervention.

In the intervention group, 95% had their medication regimens altered whilst in hospital. On average, there were 4.7 (±3.0) changes made per patient in hospital. The most common change was commencement of new medications, with an average of 2.6 (±2.1) medications started per patient. An average of 1.9 (±2.1) medications were ceased per patient, and an average of 0.1 (±0.4) medications had dosage changes per patient. Overall the average number of medications per patient increased during hospital stay from 7.6 (±5.1) on admission to 8.3 (±4.0) on discharge.

In the intervention group, 61 patients (76.3%) were adherent to their medications at follow

up and 19 (23.8%) were non-adherent to one or more regular medications. Of these, 12 patients had unintentional non-adherence and 6 had intentional changes, 1 had both. Of the 7 patients who changed their medication(s) intentionally, 4 felt that the medications were unnecessary and 3 ceased the medications after experiencing side effects. Using multivariate analysis, more than 5 medication changes made during hospital stay remained significantly associated with poor adherence, OR 0.3 (95% CI 0.1-0.9, p=0.030) (table 2).

This study showed a significant improvement in adherence rates in the intervention group (medical student led pre-discharge medication education sessions) compared to the control group one month after hospital discharge. This is a novel study. Medical students can effectively contribute to patient care by assisting in improving adherence rates. The improvement in adherence rates with an intervention based on education is consistent with some studies outside of Australia. Kripalani *et al.* performed a systematic review, which demonstrated improvement in medication adherence in six clinical trials that used informational interventions (strategies that educate and motivate patients by providing instructions) [9]. Interventions that improved adherence rates included counselling provided by hospital staff accompanied by take home written materials to reinforce what was discussed, some studies used tailored feedback, reinforcement or rewards [10-16].

Interestingly, in our study, while comparing the patients' characteristics between the two groups, the control group had significantly more carers helping with medication management. Additionally, having a carer responsible for administering medications was significantly associated with a better adherence rate in the control group [8]. Foebel *et al.* also found that presence of a caregiver at home significantly improves medication adherence for patients with heart failure and mild cognitive impairment [17]. Importantly, despite fewer carers responsible for patients' medications in the intervention group, adherence rates improved significantly, which could indicate the effectiveness of the standardised education session.

In the intervention group, multivariate analysis showed that patients with more than five medication changes made during their hospital stay had significantly poorer adherence. Nikolaus et al. found that the total number of prescribed medications and frequent changes in drug regimen in hospital were both independent factors that contributed to poorer adherence [18].

The majority of patients in this study were unintentionally non-adherent to their regular medications. In the geriatric population, Coleman *et al.* found that 50.8% of medication non-adherence is patient-associated. The majority were unintentional (33.9%), while intentional non-adherence only accounted for 4.8% of medication changes [19]. Unintentional non-adherence can be partially explained by patients' poor recall on information about their medications; either because clinicians did not provide adequate education or education was provided but communication was ineffective [20]. We postulate that the take home written medication list we provided for patients reinforced the verbal education and reduced problems with recall, hence improved medication adherence rates.

Strengths of our study included an interventional prospective design; each participant was recruited and followed up individually. Participants were recruited through convenience sampling to minimise selection bias. However, the study was limited by a relatively small sample size, inability to recruit patients of non-English speaking background and a short follow-up period. Patients who had their prescriptions filled outside of hospital pharmacy were missed as they were not identified by pharmacists. The results were compared to a prospective study published in 2016 with similar participants' characteristics, sampling method, exclusion criteria and data analysis but there were significant differences in hospital length of stay and presence of a carer. Lastly, adherence rates were based on the patients' self reported medications rather than direct observation. Future studies should continue to assess whether medical student led pre-discharge education improves adherence rates in the longer-term and improves patients' health outcomes.

In conclusion, medical student-led patient education sessions and take home medication plans given prior to hospital discharge are associated with significant improvement in medication adherence rates at one month after discharge.

(Word count 1476)

**REFERENCE:**


1. Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS. Impact of medication adherence on hospitalization risk and healthcare cost. Med Care. 2005;43:521-30.
2. Ho PM, Bryson CL, Rumsfeld JS. Medication adherence: its importance in cardiovascular outcomes. Circulation. 2009;119:3028-35.
3. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med. 2005;353:487-97.
4. Kravitz RL, Melnikow J. Medical adherence research: time for a change in direction? Med Care. 2004;42:197-9.
5. Fallis BA, Dhalla IA, Klemensberg J, Bell CM. Primary medication non-adherence after discharge from a general internal medicine service. PLoS One. 2013;8:e61735.
6. Mulhem E, Lick D, Varughese J, Barton E, Ripley T, Haveman J. Adherence to medications after hospital discharge in the elderly. Int J Family Med. 2013;2013:901845.
7. Omori DM, Potyk RP, Kroenke K. The adverse effects of hospitalization on drug regimens. Arch Intern Med. 1991;151:1562-4.
8. Mitchell B, Chong C, Lim WK. Medication adherence 1 month after hospital discharge in medical inpatients. Intern Med J. 2016;46:185-92.
9. Kripalani S, Yao X, Haynes RB. Interventions to enhance medication adherence in chronic medical conditions: a systematic review. Arch Intern Med. 2007;167:540-50.

10. Gallefoss F, Bakke PS. How does patient education and self-management among asthmatics and patients with chronic obstructive pulmonary disease affect medication? Am J Respir Crit Care Med. 1999;160:2000-5.
11. Gallefoss F, Bakke PS, Rsgaard PK. Quality of life assessment after patient education in a randomized controlled study on asthma and chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 1999;159:812-7.
12. Canto De Cetina TE, Canto P, Ordonez Luna M. Effect of counseling to improve compliance in Mexican women receiving depot-medroxyprogesterone acetate. Contraception. 2001;63:143-6.
13. Friedman RH, Kazis LE, Jette A, Smith MB, Stollerman J, Torgerson J, et al. A telecommunications system for monitoring and counseling patients with hypertension. Impact on medication adherence and blood pressure control. Am J Hypertens. 1996;9:285-92.
14. Haynes RB, Ackloo E, Sahota N, McDonald HP, Yao X. Interventions for enhancing medication adherence. Cochrane Database Syst Rev. 2008:Cd000011.
15. Marquez Contreras E, Casado Martinez JJ, Corchado Albalat Y, Chaves Gonzalez R, Grandio A, Losada Velasco C, et al. [Efficacy of an intervention to improve treatment compliance in hyperlipidemias]. Aten Primaria. 2004;33:443-50.
16. Ho PM, Lambert-Kerzner A, Carey EP, Fahdi IE, Bryson CL, Melnyk SD, et al. Multifaceted intervention to improve medication adherence and secondary prevention measures after acute coronary syndrome hospital discharge: a randomized clinical trial. JAMA Intern Med. 2014;174:186-93.
17. Foebel AD, Hirdes JP, Heckman GA. Caregiver status affects medication adherence among older home care clients with heart failure. Aging Clin Exp Res. 2012;24:718-21.
18. Nikolaus T, Kruse W, Bach M, Specht-Leible N, Oster P, Schlierf G. Elderly patients' problems with medication. An in-hospital and follow-up study. Eur J Clin Pharmacol. 1996;49:255-9.
19. Coleman EA, Smith JD, Raha D, Min SJ. Posthospital medication discrepancies: prevalence and contributing factors. Arch Intern Med. 2005;165:1842-7.
20. Molloy GJ, Messerli-Burgy N, Hutton G, Wikman A, Perkins-Porras L, Steptoe A. Intentional and unintentional non-adherence to medications following an acute coronary syndrome: a longitudinal study. J Psychosom Res. 2014;76:430-2.

**ACKNOWLEDGEMENTS:**
The authors acknowledge the help of Mr Peter Stuchbery, Director of Pharmacy at Northern Health and the ward pharmacists of The Northern Hospital.

**Figure 1. Recruitment Diagram - A flow chart representation of the recruitment process including number of patients consented, excluded, declined, followed up and analysed.**

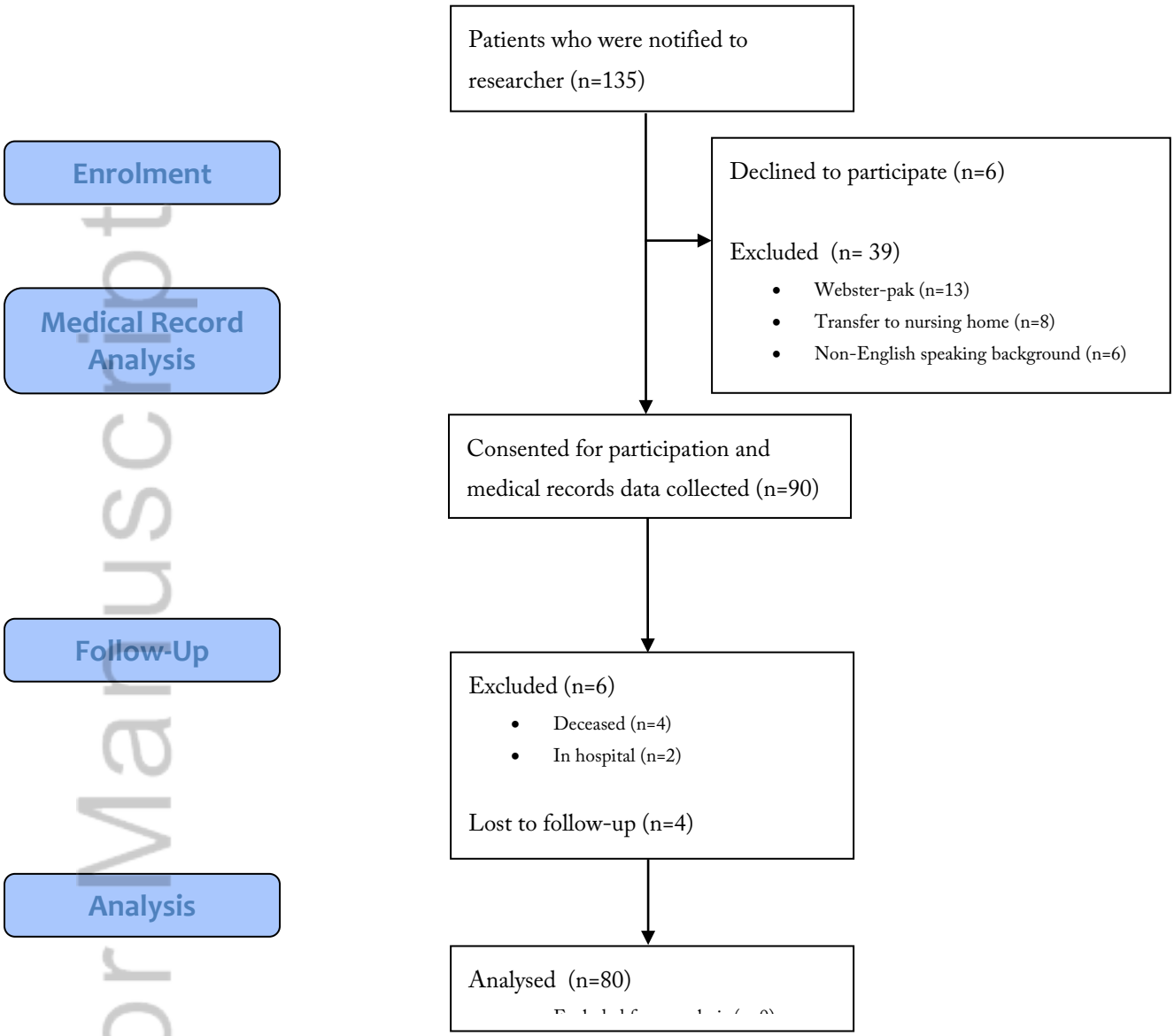

**Figure 2. An example of the take home medication list given to patients in the intervention group who have received a standardised education session conducted by one medical student.**

DAILY MEDICATION SUMMARY FOR:

NAME: (Insert patient's name here) DATE OF BIRTH: (Insert patient's DOB here)

| Time | |
|---|---|
| BEDTIME | ACID (Curam Duo Forte) 875/123mg<br>X 1 tablet (with dinner, for five days ONLY) |

**Table 1. Comparisons of patient characteristics between control and intervention groups**

IQR, interquartile range; SD, standard deviation

| Variable | | Control (n=68) | Intervention (n=80) | *P* value |
|---|---|---|---|---|
| Age, median (IQR) | | 73 (63-79) | 70 (56-80) | 0.556 |
| Male, no.(%) | | 34 (50%) | 42 (52.5%) | 0.762 |
| LOS, median (IQR) | | 5 (4-9) | 3 (2-5) | **<0.001** |
| Age Adjusted Charlson's Index, mean (SD) | | 5.4 (±2.7) | 4.6 (±3.2) | 0.110 |
| Carer responsible for medications, no.(%) | | 22 (32.4%) | 13 (16.3%) | **0.022** |
| Education level of person responsible | Pre-Primary, no.(%) | 0 (0.0%) | 2 (2.5%) | 0.133 |
| | Primary, no.(%) | 4 (5.9%) | 11 (13.8%) | |
| | Lower secondary, no.(%) | 7 (10.3%) | 8 (10.0%) | |
| | Upper secondary, no.(%) | 28 (41.2%) | 37 (46.3%) | |
| | Post secondary not tetiary, no.(%) | 16 (23.5%) | 9 (11.3%) | |
| | Undergradaute, no.(%) | 13 (19.1%) | 11 (13.8%) | |
| | Postgraduate, no.(%) | 0 (0.0%) | 2 (2.5%) | |
| No. of admission medications, mean (SD) | | 8.6 (±4.1) | 7.6 (±5.1) | 0.172 |
| No. of discharge medications, mean (SD) | | 9.6 (±3.9) | 8.3 (±4.0) | 0.058 |

**Table 2. Predictors associated with increased odds of adherence 1 month after discharge**

OR, odds ratio; CI, confidence interval, LOS, length of hospital stay; GP, General Practitioner; ED, Emergency department

| | | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Unadjusted OR (95% CI) | | Unadjusted *p*-value | Adjusted OR (95% CI) | | Adjusted *p*-value |
| Age | <65 | 1.0 | - | - | - | - | - |
| | 65-84 | 1.3 | (0.4-3.9) | 0.686 | - | - | - |
| | 85 or older | 1.0 | (0.2-4.8) | 0.957 | - | - | - |
| Male | | 1.3 | (0.47-3.7) | 0.608 | - | - | - |
| LOS | Day 0-1 | 1.0 | - | - | - | - | - |
| | Day 2-3 | 2.0 | (0.4-9.4) | 0.381 | - | - | - |
| | Day >3 | 0.8 | (0.2-2.9) | 0.684 | - | - | - |
| Aged adjusted Charlson's Index | | 1.1 | (0.9-1.3) | 0.396 | - | - | - |
| Carer responsible for medications | | 4.4 | (0.5-36.4) | 0.168 | 2.7 | (0.3-25.1) | 0.384 |
| Education level of person responsible | Primary | 1.0 | - | - | 1.0 | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Secondary | 1.7 | (0.5-6.3) | 0.413 | 1.4 | (0.3-6.0) | 0.613 |
| | Post Secondary | 6.3 | (1.0-39.1) | **0.050** | 5.7 | (0.7-46.8) | 0.106 |
| No. of admission medications | | 1.0 | (0.9-1.1) | 0.962 | - | - | - |
| No. of discharge medications | | 1.0 | (0.9-1.1) | 0.997 | - | - | - |
| No. of medication ceased in hospital | | 0.8 | (0.7-1.1) | 0.158 | - | - | - |
| No. of medication started in hospital | | 0.8 | (0.6-1.0) | 0.107 | - | - | - |
| No. of dosage change in hospital | | 2.7 | (0.3-20.4) | 0.347 | - | - | - |
| More than 5 medication changes in hospital | | 0.2 | (0.1-0.7) | **0.007** | 0.3 | (0.1-0.9) | **0.030** |
| No. of medications taken on follow-up | | 1.0 | (0.9-1.2) | 0.662 | - | - | - |
| Doctor(s) altered medications post discharge | | 2.0 | (0.7-5.6) | 0.202 | - | - | - |
| Visited GP | | 0.9 | (0.2-3.4) | 0.822 | - | - | - |
| Visited Outpatient Clinic | | 0.8 | (0.3-2.6) | 0.755 | - | - | - |
| Visited ED | | 0.3 | (0.1-1.1) | 0.079 | 0.3 | (0.1-1.2) | 0.085 |
| Readmission back to hospital | | 0.4 | (0.1-1.6) | 0.207 | - | - | - |