Capture the fracture by SMS

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Keywords
SMS, osteoporosis treatment guidelines, adherence

Summary
In this observational study a SMS reminder system was tested to improve patient adherence to osteoporosis drug therapy. 399 of 1323 osteoporosis fracture patients could be documented. 66 % of patients who received a SMS recommendation arranged an appointment with their primary care physician. A large proportion of the physicians followed these recommendations. As more elderly patients declined to participate, the SMS tool seems to be useful in younger seniors (< 70 years).

Schlüsselwörter
SMS, Leitlinien Osteoporose, Adhärenz

Zusammenfassung
In dieser Beobachtungsstudie wurde ein SMS-Erinnerungssystem getestet, welches die Adhärenz von Patienten gegenüber einer medikamentösen Osteoporosetherapie verbessern soll. 399 der 1323 Patienten mit osteoporotischen Frakturen konnten dokumentiert werden. 66 % der Patienten, die eine Erinnerung per SMS erhielten, vereinbarten einen Termin mit ihrem Hausarzt. Ein großer Anteil der Ärzte folgte den Empfehlungen. Da mehr ältere Patienten die Teilnahme ablehnten, scheint das SMS-Tool eher für jüngere Senioren (< 70 Jahre) sinnvoll zu sein.

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Introduction

A lot of research in osteoporosis has been done in the last 20 years and plenty of novel therapies were introduced to the market. Although evidence based osteoporosis diagnostic and treatment algorithms were developed and smoothly adopted by the medical societies, several studies show that their adoption in daily medical practice is suboptimal (1–4).

In a large prospective Swiss survey of patients older than 50 years who presented to the emergency ward with a fragility fracture only 24 % of women and 13,8 % of men were subsequently appropriately treated with a bone active substance (3). A finding that is consistent with underdiagnosis and undertreatment of osteoporosis reported in other countries (4). Considering that only evidence based guidelines that are used in daily practice will eventually result in an improved outcome in terms of fracture incidence reduction, there is a large unmet need for improving physician and patient adherence to diagnostic and therapeutic recommendations.

Various different reasons from restricted access to osteoporosis drugs to a lack of osteoporosis awareness contribute to this treatment gap (5). Physicians might have different focuses in managing elderly patients with multimorbidity in primary care. Further, the wide variation in specialists involved in the care of osteoporosis fracture patients such as orthopedic surgeons, rheumatologists, endocrinologists, geriatricians and primary care physicians (PCP) may induce inconsistent patient care and a suboptimal voice to "defend" the interests of osteoporosis (5).

In the same time communication technology has developed rapidly from the first mobile phone, internet and email to smart phones with WhatsApp. The tool of SMS (short message service) text messages increased adherence to treatment in several studies such as HIV therapy, asthma and hypertension (6–9) and improved rates of healthcare appointment attendance (10). To our knowledge, no study has investigated the effect of a mobile text message in the management of osteoporosis fracture patients yet.

Aim

The aim of this study was to test if SMS is a useful tool to improve adherence to drug therapy in osteoporosis patients. We evaluated whether a mobile text message to osteoporosis fracture patients changed actions taken by the primary care physician (PCP).

Methods

The study was initiated by the Swiss Society Against Osteoporosis (SVGO). After ethical approval (KEK 2012–0047) five osteoporosis centres in Switzerland were asked to participate. Two centres (Triemlispital Zurich and St. Gallen) agreed to include at least 100 patients over the age of 50 years with a non-traumatic fracture (inclusion criteria). After giving informed consent (exclusion criteria: no mobile phone and trauma fracture) participants were asked to provide their mobile phone numbers and to complete the nine FRAX® tool questions (11). A SMS message was sent one and two months after the fracture to the patient. The SMS message included a clear procedure instruction ac-

Tab. 1 Baseline characteristics of participants and non-participants

Variable	All	Participants	Non-participants	Two-sided P value between groups
N	1323 (100.0 %)	399 (30.2 %)	924 (69.8 %)	
Center 2 KSSG (%)	148 (11.2 %)	109 (27.3 %)	39 (4.2 %)	<0.0001
Center 1 Triemlispital (%)	1175 (88.8 %)	290 (72.7 %)	885 (95.8 %)	<0.0001
Men (%)	327 (24.7 %)	132 (33.1 %)	195 (21.1 %)	<0.0001
Age (Median, IQR), Jahre	**77.0 (66.0 to 84.0)**	**66.0 (58.0 to 74.0)**	**81.0 (72.0 to 86.0)**	**<0.0001**
Fracture VertFx (%)	251 (19.0 %)	88 (22.1 %)	163 (17.6 %)	0.0568
Fracture RadiusFx (%)	155 (11.7 %)	67 (16.8 %)	88 (9.5 %)	0.0002
Fracture HumerusFx (%)	**142 (10.7 %)**	**35 (8.8 %)**	**107 (11.6 %)**	**0.1232**
Fracture HipFx (%)	270 (20.4 %)	55 (13.8 %)	215 (23.3 %)	<0.0001
Fracture OtherOPFx (%)	384 (29.0 %)	129 (32.3 %)	255 (27.6 %)	0.0755
Fracture NonOPFx (%)	118 (8.9 %)	24 (6.0 %)	94 (10.2 %)	0.0119

cording to the FRAX® assessment tool based on the Swiss threshold guidelines to treat osteoporosis patients with fractures. Six months after fracturing, participants completed a questionnaire assessing the action of the patient and the PCP whether osteoporosis related diagnostic and therapeutic procedures were started or changed.

Statistical analysis was done using StatsDirect statistical software, Altrincham, Cheshire, United Kingdom version 2.8.0. Descriptive statistics was calculated (mean and 95 % confidence interval for normally distributed variables; median and interquartile range for non-normally distributed variables). Non-normality of distribution was tested by Shapiro-Wilk Test 2. Exploratory tests for statistically significant differences (significance threshold two-sided $p<0.05$) between post hoc defined subgroups were used. Depending on the different variables the following tests were used: Mann-Whitney U-test, Proportions with categorical/dichotomous variables: z-test.

Results

1323 fracture patients treated in centre 1 Triemlispital Zurich (n = 1175, 88.8 %) and centre 2 Kantonsspital St. Gallen (n = 148, 11.2 %) were asked to participate between January 2013 and January 2015. 924 patients refused to participate due to several reasons. 399 patients and the post fracture treatment initiated by the PCP were evaluated. Participants, median age 66 (58–74) years were significantly younger than non-participants, median age 81 (72–86) years, $p<0.0001$. Only a small proportion of the femoral fracture patients agreed to participate (13.8 % vs 23.3 %, $p<0.0001$). The major fractures contributed to 60 % of all screened fractures (▶Table 1).

About 49 % of patients were above the drug intervention threshold based on the current SVGO guidelines (12).

One Patient died and could not be interviewed. Data for FRAX® calculation of 10 participants was not available (▶Table 2).

▶Table 3 depicts the four SMS messages, which were sent twice to the participants.

▶Table 4 shows the actions of the patients and the treating PCPs. In contrast to ▶Table 3 it has two more categories: no PCP visit and patient already on treatment. Although 399 participants received the

Variable	Value
FRAX® Risk for Major fractures (median, IQR)	16.0 (10.0–26.0)
FRAX® Risk for hip fracture (median, IQR)	4.0 (1.5–9.3)
Frax® Treshold above (n/N, %)	193/398 (48.5 %)
Frax® Treshold below (n/N, %)	195/398 (49.0 %)
Frax® Treshold missing (n/N, %)	10/398 (2.5 %)

Tab. 2 FRAX® scores of participants

Variable	n/N (%)
SMS message 1 (%)	51/399 (12.8 %)
SMS message 2 (%)	196/399 (49.1 %)
SMS message 3 (%)	108/399 (27.1 %)
SMS message 4 (%)	24/399 (6.0 %)
SMS message unknown (%)	20/399 (5.0 %)

Table 3 SMS-messages sent to the fracture patients according to the guidelines of the SVGO

1 = We recommend no additional diagnostic procedure or drug therapy
2 = We recommend an osteoporosis assessment with densitometry and drug treatment according to guidelines
3 = We recommend anti-osteoporosis drug treatment
4 = We recommend a new evaluation of the current antiosteoporotic drug therapy

messages only 67 % arranged an appointment. 33 % of participants did not organize a PCP appointment, reasons for this non-compliance were not evaluated.

Subgroup analysis of the participants, who organized an appointment, documented the following results:

a) PCPs followed the recommendation "No need for osteoporosis assessment" (message 1) in 84 % (27/32) of cases.
b) PCPs followed the recommendation "Need for osteoporosis assessment" (message 2) in 52 % of cases.
c) PCPs followed the advice "Recommendation for antiosteoporotic drug therapy" (message 3) in 75 % of cases.
d) PCPs followed the recommendation "Evaluation of the current drug therapy" (message 4) in 100 % of cases.

Table 4
Post-SMS Action

Variable	n/N (%)
Post-SMS Action: no PCP visit by patient (n/N, %)	132/399 (33.1 %)
Post-SMS action: PCP appointment (n/N, %)	**267/399 (66.9 %)**
PCP action: nothing (n/N, %)	119/267 (44.6 %)
PCP action densitometry (n/N, %)	62/267 (23.2 %)
PCP action novel therapy (n/N, %)	50/267 (18.7 %)
PCP action: change of therapy (n/N, %)	11/267 (4.1 %)
PCP action: continue therapy (n/N, %)	17/267 (6.4 %)
PCP action: Patient already on therapy (n/N, %)	8/267 (3.0 %)

Discussion

The aim of this Swiss study was to test if a short text message is a useful tool to improve adherence to drug therapy in osteoporosis patients. Patients who presented to the hospital with a fracture were categorized in terms of treatment necessity using the FRAX® assessment tool and the Swiss threshold guidelines (13–15). A SMS with a clear recommendation was sent to the patient and patients were interviewed about their actions and the actions of their PCP.

The study participants were significantly younger than the non-participants. One explanation might be that the non-participants were significantly older and probably not using mobile phones and SMS technology. Other SMS reminder studies in chronic diseases (hypertension, HIV, asthma) were mainly done in a younger population (7–9).

The major fractures (humerus, radius, vertebral, hip) contributed to 60 % of all screened fractures, this is in line with other studies (16, 17).

One third of patients did not schedule an appointment with their PCP, reasons of which were not evaluated. The other two thirds of patients organized an appointment with their PCP. Most of the PCPs followed the recommendations.

In conclusion it would be appropriate to send the SMS not only to the patient but also to the PCP. Alternatively, treatment recommendations could be included in the discharge letter sent to the PCP. In general, treatment recommendations need an excellent cooperation and communication between the different service providers in the hospital such as orthopedic surgeons, traumatologists, rheumatologists and geriatricians. There is still an ongoing need to establish fracture liaison services (18, 19).

As some of the antiosteoporotic therapies could be given by parenteral administration, the initiation of the drug therapy could already be started in the hospital in addition to the instruction of a muscle strengthening and balance exercise program (20, 21). However, this needs the financial adaption of the fracture DRGs, which should also include the appropriate medications.

As treatment guidelines and cost effectiveness data differ from country to country, some treatment proposals could be added to the FRAX® assessment tool (22, 23).

This study has some limitations. First there was no control group by design and secondly not all elderly participants had a cell phone. This limitation restricts the feasibility to those provided with the required technology and constitutes a bias as older patients are less likely to have a cell phone but more likely to need intervention. In addition elderly patients may have cognitive deficits understanding the SMS.

This observational study shows that short and simple SMS recommendations were generally well followed by the recipient younger than 70 years and typically lead to consistent action taken by the treating physician. Therefore we think that the SMS reminder system seems to be an appropriate tool for patients younger than 70 years.

In addition our findings emphasize the importance of patient empowerment and self-involvement for driving physician behavior. This is consistent with earlier reports indicating that patients, who assumed responsibility for their bone health engaged in more health related behaviors than those who believed that somebody else is in charge (22).

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Conflict of interest

((■■■bitte angeben, ob ein Conflict of interest besteht)) (1)

Compliance with ethical guidelines

((■■■bitte die Angaben ergänzen: ethical approval (KEK 2012–0047.....)) (2)

References

1. Balasubramanian A et al. Declining rates of osteoporosis management following fragility fractures in the U.S., 2000 through 2009. J Bone Joint Surg Am 2014; 96 (7): e52.

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(2) Approval by the responsible ethical commission on March 2012: KEK 2012-0047.

2. Leslie WD et al. A population-based analysis of the post-fracture care gap 1996–2008: the situation is not improving. Osteoporos Int 2012; 23 (5): 1623–1629.
3. Suhm N et al. Management of fragility fractures in Switzerland: results of a nationwide survey. Swiss Med Wkly 2008; 138 (45–46): 674–683.
4. Andrade SE et al. Low frequency of treatment of osteoporosis among postmenopausal women following a fracture. Arch Intern Med 2003; 163 (17): 2052–2057.
5. Kanis JA et al. SCOPE: a scorecard for osteoporosis in Europe. Arch Osteoporos 2013; 8: 144.
6. Tao D, Xie L, Wang T. A meta-analysis of the use of electronic reminders for patient adherence to medication in chronic disease care. J Telemed Telecare 2015; 21 (1): 3–13.
7. Strandbygaard U, Thomsen SF, Backer V. A daily SMS reminder increases adherence to asthma treatment: a three-month follow-up study. Respir Med 2010; 104 (2): 166–171.
8. Rana Y et al. Short message service (SMS)-based intervention to improve treatment adherence among HIV-positive youth in Uganda: focus group findings. PLoS One 2015; 10 (4): e0125187.
9. Leon N et al. Improving treatment adherence for blood pressure lowering via mobile phone SMS-messages in South Africa: a qualitative evaluation of the SMS-text Adherence SuppoRt (StAR) trial. BMC Fam Pract 2015; 16: 80.
10. Gurol-Urganci I et al. Mobile phone messaging reminders for attendance at healthcare appointments. Cochrane Database Syst Rev 2013; 12: CD007458.
11. FRAX WHO Fracture Risk Assessment Tool.
12. SVGO Osteoporose Empfehlungen.
13. Kanis JA et al. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteoporos Int 2013; 24 (1): 23–57.
14. DVO-Osteoporose-Leitlinie-2014. Leitlinie zur Prophylaxe, Diagnostik und Therapie der Osteoporose bei Männern ab dem 60. Lebensjahr und bei postmenopausalen Frauen 2014.
15. Lippuner K et al. FRAX assessment of osteoporotic fracture probability in Switzerland. Osteoporos Int 2010; 21 (3): 381–389.
16. Brennan SL et al. Sex- and age-specific associations between income and incident major osteoporotic fractures in Canadian men and women: a population-based analysis. Osteoporos Int 2015; 26 (1): 59–65.
17. Bergström U et al. Fracture mechanisms and fracture pattern in men and women aged 50 years and older: a study of a 12-year population-based injury register, Umeå, Sweden. Osteoporos Int 2008; 19 (9): 1267–1273.
18. Miller AN, Lake AF, Emory CL. Establishing a fracture liaison service: an orthopaedic approach. J Bone Joint Surg Am 2015; 97 (8): 675–681.
19. Nakayama A et al. Evidence of effectiveness of a fracture liaison service to reduce the re-fracture rate. Osteoporos Int 2016; 27 (3): 873–879.
20. Bischoff-Ferrari HA et al. Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: a randomized controlled trial. Arch Intern Med 2010; 170 (9): 813–820.
21. Lacroix A et al. Effects of a Supervised versus an Unsupervised Combined Balance and Strength Training Program on Balance and Muscle Power in Healthy Older Adults: A Randomized Controlled Trial. Gerontology 2016; 62 (3): 275–288.
22. Marques A et al. The accuracy of osteoporotic fracture risk prediction tools: a systematic review and meta-analysis. Ann Rheum Dis 2015; 74 (11): 1958–1967.
23. Sale JE et al. Strategies used by an osteoporosis patient group to navigate for bone health care after a fracture. Arch Orthop Trauma Surg 2014; 134 (2): 229–235.