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Letter to the Editor

Effect of motivational mobile phone short message service on aspirin adherence after coronary stenting for acute coronary syndrome

Jacques Quilici [a,b,c], Lionel Fugon [d,e,f], Shirley Beguin [g], Pierre Emmanuel Morange [b,c,h], Jean-Louis Bonnet [a,b,c], Marie-Christine Alessi [b,c,h], Patrizia Carrieri [d,e,f], Thomas Cuisset [a,b,c,*]

[a] Département de Cardiologie, CHU Timone, Marseille, F-13385 France
[b] INSERM, UMR1062, «Nutrition, Obesity and Risk of Thrombosis», F-13385, Marseille, France
[c] Aix-Marseille Université, Faculté de Médecine, F-13385, Marseille, France
[d] Inserm, U912 (SE4S), Marseille, France
[e] Université Aix-Marseille, IRD, UMR-S912, Marseille, France
[f] ORS PACA, observatoire régional de la santé Provence-Alpes-Côte-d'Azur, Marseille, France
[g] Assistance Publique-Hôpitaux de Marseille, Equipe Mobile d'Aide à l'Investigation (EMAI), France
[h] Laboratoire d'Hématologie, CHU Timone, Marseille, F-13385, France

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Antiplatelet therapy is the cornerstone therapy after coronary stenting for stent thrombosis (ST) prevention [1]. Aspirin resistance [2] or non-adherence [3,4] has been identified as important risk factor for recurrent ischemic events. We already used platelet function testing to detect aspirin non-adherent patients [5,6]. Based on aspirin adherence monitoring, the present study aims at testing the hypothesis that participants receiving daily motivational short message service (SMS) had better completion rates compared to standard care. We thought that daily personalized mobile phone communication between health-care team and stented patients could improve patient outcomes by both reminding patients to take their antiplatelet therapy and by providing support to the patients. Patients were considered eligible to enter the study if they undergone coronary stenting for ACS with good in-hospital aspirin response defined by arachidonic acid induced platelet aggregation (AA-Ag) lower than 30% [5,6]. Participants needed to own a mobile phone with ability to communicate via short message service (SMS). Patients received non-enteric coated aspirin 75 mg daily as a directly-observed therapy administered by a nurse during hospitalization, to minimize the risk of non-adherence. Patients were discharged with a prescription of aspirin 75 mg and clopidogrel and were provided with educational sessions highlighting the importance of patient adherence to physicians' recommendations. Patients, randomized to SMS, received for one month a daily personalized SMS reminding aspirin intake, with different formulation every day. One month after hospital discharge, patients were admitted to our Antiplatelet Monitoring Unit and were asked if they were actually taking their medication; good adherence was defined as more than 95% of prescribed doses in the past 30 days. Assessment of 'outpatient response to aspirin' with AA-Ag was performed during this consultation (between 1 and 12 h after aspirin intake). Patients identified as non-responders received directly observed aspirin therapy 75 mg before reassessment on the same day, 2 h after controlled administration, in order to exclude bioavailability problems and to properly identify non-adherent patients. Patients gave written informed consent for participation. The primary outcomes were one month self-reported aspirin adherence and controlled aspirin adherence using platelet function testing. 546 patients were consecutively enrolled in our study. (Fig. 1). Table 1 reports the socio-demographics and baseline characteristics of both groups. Controlled non-adherent patients, assessed by platelet testing, accounted for 11.2% of the standard care group versus 5.2% in the SMS intervention group (OR [95%CI]: 0.43 [0.22–0.86]; p = 0.01, NNT = 17). Based on oral and paper questionnaire, only 3.6% patients reported that they have stopped aspirin therapy, whereas 5.2% patients were identified as non-adherent patients with AA-Ag testing in the SMS group. We found the same discrepancy in the standard care group: 16 patients (6.4%) reported aspirin withdrawal whereas AA-Ag testing identified 28 patients (11.2%) as non-adherent. As with monitored adherence, SMS intervention significantly improves self-reported aspirin adherence (OR [95%CI]: 0.37 [0.15–0.90]; p = 0.02. NNT = 23) (Fig. 2). Among the 41 non-adherent patients, 21 claimed that they simply forgot the medication and 20 stopped it because of side effects, mainly bleedings. At the end of the study, 92% patients in the intervention group reported their satisfaction and thought the SMS support service was valuable.

This study shows that mobile health innovations with daily SMS motivational support were likely to improve aspirin adherence at one month compared to standard care alone. Evidence for relationship between premature discontinuation of antiplatelet therapy and stent thrombosis is

* Corresponding author at: Département de Cardiologie, CHU Timone, Marseille, F-13385 France. Tel.: +33 49185794; fax: +33 491384726.
E-mail address: thomas.cuisset@ap-hm.fr (T. Cuisset).

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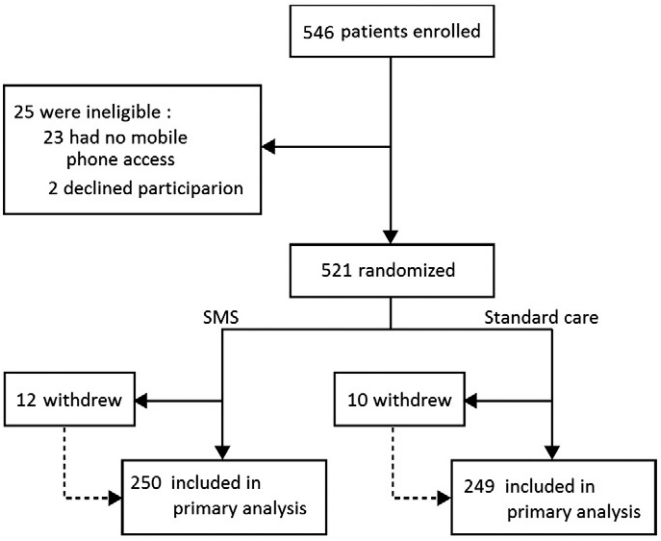

Fig. 1. Flow chart of the study.

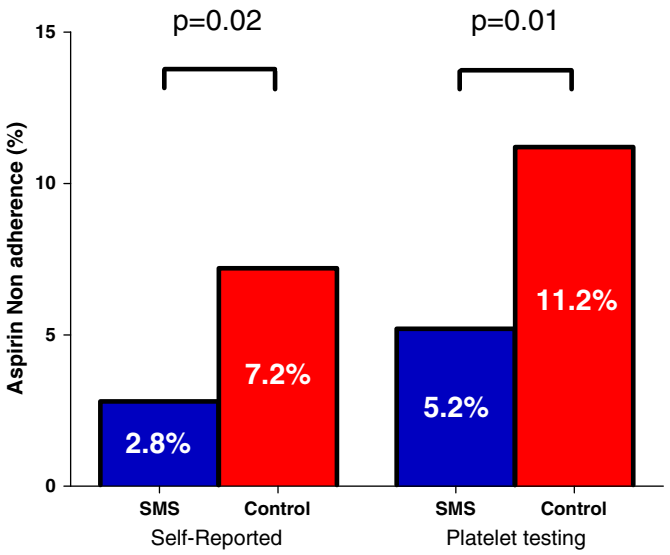

Fig. 2. Impact of short message service (SMS) on self-reported aspirin adherence and adherence monitored by platelet function testing (Arachidonic acid induced platelet aggregation).

stronger for the first month irrespective of the stent type (DES or BMS), highlighting the paramount importance of treatment adherence in the early phase after stent implantation. The rate of discontinuation of antiplatelet therapy during the first months after coronary stenting is at least 10% [6]. The factors related to non-adherence are complex, including patient-centered factors, healthcare system factors, socio-economic factors and therapy-related factors. Interventions to improve adherence to antiplatelet drugs should be developed using an appropriate theoretical framework including objective assessment of the process. The risk of underreporting adherence when using patients' self-report exists but it can be overcome by measuring complementary indicators based on other sources. For this reason we used biological specific platelet testing to validate the impact of motivational SMS. This assessment is linearly related to adherence levels in case of a homogenous degree of response, such as aspirin response. While healthcare providers play a pivotal role in maximizing patient adherence [7], individually tailored, computer generated reminders can produce positive effects on patient's behavior. Such interventions are inexpensive, widely available, and offer the potential to both improve clinical care and impact health outcomes. Pilot studies of mobile health technologies are emerging in a broad range of disorders, particularly for patients taking antiretroviral therapy for HIV infection with a significant benefit for adherence [8]. A single-factor approach might be expected to have limited effectiveness, while many dimensions (social and economic factors, health care team and systems-related factors, therapy-related factors, condition-related factors and patient-related factors), should be considered to consistently improve adherence. During hospitalization, we provided tailored counseling to encourage and support progress towards adherence, with focus on simplification of the medical regimen, the immediacy of beneficial effects, and the possible APT side-effects. After discharge, patients need to be continuously motivated which drives sustainable good adherence. Our daily SMS program intervenes at this level, with personalized queries received at the time of prescribed intake. This is of particular importance after an ACS, transition to home is brutal with frequent persistent anxiety and depressive mood impacting adherence [9]. As conclusion, improving adherence is a major clinical issue, which applies especially to aspirin therapy after ACS and stent implantation. There is still no real consensus concerning the most effective way to improve patient compliance, and no single intervention strategy can be expected to resolve the problem. Results of the present pilot study show that innovative tools, such as daily personalized SMS, improved the rate of antiplatelet intake after stent implantation. This widely available educational tool could be cost-effective to improve patient outcome after ACS.

Table 1
Baseline characteristics according to the assigned group.

Characteristics	Standard care (n = 249)	SMS (n = 250)	P-value
Age, (years)	64 +/− 10	64 +/− 14	0.60
Men, n (%)	187 (75.1)	195 (78)	0.36
Immigrants, n (%)	23 (9.2)	25 (10)	0.88
Hypertension, n (%)	139 (55.8)	142 (56.8)	0.86
Diabetes mellitus, n (%)	79 (31.7)	70 (28)	0.38
Current smoker, n (%)	90 (36.1)	87 (34.8)	0.78
Dyslipidemia, n (%)	134 (53.8)	131 (52.4)	0.79
Familial history, n (%)	85 (34.1)	96 (38.4)	0.35
ST elevation ACS	52 (20.8)	56 (22.4)	0.74
Non-ST elevation ACS	197 (79.2)	194 (77.6)	0.73
Left ventricular ejection fraction, (%)	55 +/− 8	56 +/− 6	0.79
Creatinine, (μmol/L)	97 +/− 68	93 +/− 66	0.87
BMI, (kg/m^2)	27.2 +/− 3	26.8 +/− 4	0.53

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