Patient Education in the Emergency Department

Evaluation of methods, target groups, and costs of discharge instructions

SEH

Zorg na Spoedeisende Hulp

Amber E. Hoek

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Chapter 1

General Introduction.

GENERAAL INTRODUCTION

An Emergency Department (ED) is a department at a hospital where a diverse patient population with a broad spectrum of acute medical problems is being treated. Mostly patients arrive at the ED after referral from a general practitioner or by ambulance. However, sometimes patients go to the ED on their own initiative. In almost all cases, patients present to the ED with an acute problem. In the past decade, annually of approximately 2 million patients visited the Emergency Department in the Netherlands and this number increases steadily.[1-4] Typically, an ED visit consists of registration at the entrance, triage to determine the priority of patient treatment, consultation with a physician and diagnostic tests if indicated. Subsequently, patients may be treated in the ED, admitted for treatment or observation to a hospital ward or discharged to the home environment.

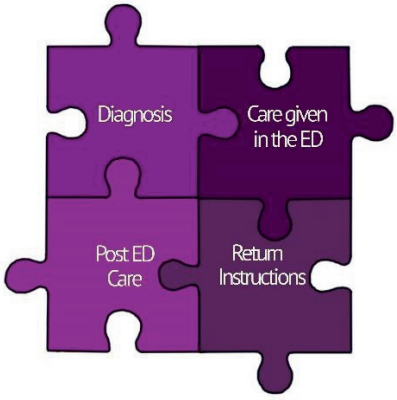
Discharge instructions

If patients are discharged to the home environment they will receive discharge instructions. Discharge instructions in the ED are defined as information relevant to a patient's medical condition provided to the patient or the patients representative at the time of patient's discharge from the ED, for the purpose of facilitating safe and appropriate continuity of care.[5]

Discharge instructions can be divided into four domains: discharge instructions about diagnosis and cause, care given in the ED, care after the ED visit, and instructions on when to return to the ED (figure 1).[6]

1. Discharge instructions about **diagnoses** and cause include detailed information about the medical condition and possible cause.
2. Discharge instructions about **care given in the ED** include information about which tests were performed in the ED, e.g. laboratory test, X-rays, electrocardiogram. It also includes information about which treatment was given in the ED, e.g. which medication or reposition of luxation.
3. Discharge instructions about **post-ED care** include instructions about medication that is prescribed, the doses and schedule of medication, ancillary measures and follow-up instructions.
4. **Return instructions** include information about follow-up in the outpatient clinic, symptoms that require return to the ED, and when they should visit their general practitioner.

Figure 1: The four domains of discharge instructions



A widely encountered problem in health care in general is that patients may not comprehend or recall the discharge instructions that they have received. Comprehension of discharge instructions is the ability to understand the discharge instructions. A prospective study in the ED showed that 78% of patients demonstrated deficits in comprehension in at least one of the four domains of discharge instructions.[6] If the discharge instructions are understood, they also have to be recalled. Studies showed that less than half of the verbal discharge instructions are recalled correctly in all domains.[7-10]

Sufficient comprehension and recall of discharge instructions in the ED may be challenging due to multiple factors, such as the stressfulness of the acute event and limited time available for discharge instructions by the health professional.[11] Sometimes during discharge instructions, patients were asked if they have any questions about their discharge instrucions.[11, 12] However, confirming patients' understanding of discharge instructions is lacking in most of the conversations about discharge instructions.[11, 12]

Deficits in recall and comprehension of discharge instructions raises concerns about the patients' ability to adhere to their therapy at home recommended in the ED (compliance).[13, 14] In addition, it raises concerns about the safety of patients, for example if return instructions are not clear.[15]

Finally, poor understanding and recall of discharge instructions may lead to unnecessary return or GP-visits, which will in its turn increase the burden on the healthcare system.[16]

Communication

For recall and comprehension of discharge instructions transfer of information is required. In all situations in which information is transferred, there is a sender and an receiver. When giving discharge instructions in the ED, most of the time the sender is the treating physician or nurse, the receiver is the patient, the patient's friend or family member. A sender can also be a receiver at the same time, for instance if the patient asks the treating physician a question about the discharge instructions.[17]

Various factors can influence information transfer.
Receiving party (mostly patient) - A visit to the ED is a stressful experience for patients. Patients are often ill, shocked, and concerned about their medical condition. This makes it difficult for patients to remember the information they from the doctor or nurse. Also a language barrier or if a patient is intoxicated are factors that complicate information transfer.
Sending party (mostly medical staff) - It is often a challenge for doctors to provide clear and complete information to patients because of crowding.[18] Though discharge instructions are an important part of the ED visit, a study showed that the average time of giving discharge instructions is 76 seconds (range 7-202 seconds).[19] Also, too much information and use of technical terms can hamper information transfer.

Improving discharge instructions
Discharge instructions can be provided in several ways. Usually, the patient will receive verbal discharge instructions from the treating physician and / or nurse. In addition, hand written or pre-printed leaflets are available in many EDs and can be handed to the patient at discharge.
In addition, nowadays there are modern communication tools available that can be used for discharge instructions, such as video applications or websites, that can be referred to by the treating physician.[20, 21]
Additional to discharge instructions in the ED, shortly after the ED visit discharge instructions can be provided by telephone follow-up or text message.[22-24] In the Netherlands, there is no national guidance on how to provide discharge instructions. The manner of providing discharge instructions therefore varies widely per hospital. Also internationally, there is no standard in giving discharge instructions and this can differ widely between countries.[5]

It is important to investigate the effect of the different manners of providing discharge instructions in order to determine the optimal way for each patient group after an ED visit.
Optimal discharge instructions ensure good quality of care and improved patient safety. However, for different patients groups, different manners of discharge instructions may be indicated. This thesis focuses on two patient groups, namely patients with Mild Traumatic Brain Injury (MTBI) and patients who experience pain.
MTBI is a common diagnosis in the ED. In the first weeks to months after MTBI, many patients suffer from post-concussion symptoms.[25] Decent discharge instructions are important and they can possibly even reduce the post-concussion symptoms.[26] However, memory and concentration problems are one of the symptoms of MTBI, which makes recall and comprehension of information more complicated. Therefore, it is strongly recommended to provide written discharge instructions to MRTBI patients at discharge.[27] Alternatively, discharge instructions via video can be given, however the effect of video discharge instructions in MTBI patients has not yet been investigated.
Another common experienced symptom by ED patients is pain. Many patients are discharged to their home environment after an ED visit with advice for analgesic use. For use of analgesics, it is important that patients know which dose and in which frequency they should use the medication.[28] However, having pain impairs memory, and thereby hindering recall of discharge instructions.[29] Giving written discharge instructions to patients with pain may be of additional value.

In case of children who presented at the ED with pain and who received advice on analgesic use it is even more difficult to give discharge instructions, since the dosage of analgesics in children is weight-based. In addition, parents may have prejudice about the use of analgesics, which makes discharge instructions even more important. Therefore, giving written, patient adjusted discharge instructions, may improve recall as well as compliance.
Because of the specific needs of these patients groups, that are often seen in the ED, these groups have been chosen as the study groups in this thesis.

Aim and outline of this thesis
The main aim of this thesis is to expand our knowledge on patient education in the ED. The thesis consists of two parts. In part 1 (chapters 2-4) studies are presented that focus on comprehension and recall of standardized discharge instructions. In part 2 (chapters 5-7) a novel strategy for video discharge instructions is evaluated.

The aim of this thesis will be explored using the following three research questions.

1. Does the method of discharge instructions in EDs influence comprehension and recall of patients and their caregivers? (chapters 2 and 6)

2. What are effects of written and video discharge instructions on comprehension and recall of discharge instructions in different patient groups? (chapters 3, 4 and 5)

3. What is the effect of written and video discharge instructions on health care consumption and productivity costs of MTBI patients? (chapter 7)

The first research question is addressed by chapters 2 and 6. These chapters describe the effect of different methods of providing discharge instructions in the ED on comprehension and recall of the discharge instructions. Chapter 2 provides a systematic overview of different methods of discharge instruction (verbal, written and video) and their effect on recall and comprehension. In chapter 6 the effect of video discharge instructions on post-concussion symptoms in patients with Mild Traumatic Brain Injury is evaluated.

The second research question is addressed by chapters 3, 4, and 5. These chapters describe the effect of different methods of discharge instructions on recall and comprehension of different patients groups. Chapter 3 describes the effect of introducing written discharge instructions on recall by adult patients who were discharged with advice for analgesic use. Chapter 4 focuses on the same topic, but now addresses recall in parents of children who were discharged from the ED with advice for analgesic use. Chapter 5 provides insight in the attitude towards video discharge instructions on MTBI of lay people, healthcare professionals and patients with MTBI.

The third research question is addressed by chapter 7. This chapter provides an overview of the effect of written and video discharge instructions on health care consumption and productivity costs of MTBI patients.

This thesis is concluded with a general discussion in chapter 8. In this chapter we discuss the results of this thesis including the strengths and limitations. Moreover, we discuss the societal impact of this thesis and advice is given to researchers and clinicians on how to implement the results of this thesis in daily practice.

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Part I

Introducing standardized discharge instructions.


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Chapter 2

Patient discharge instructions in the Emergency Department and their effects on comprehension and recall of discharge instructions: a systematic review and meta-analysis.

Hoek AE, Anker SCP, van Beeck EF, Burdorf A, Rood PPM, Haagsma JA.

Ann Emerg Med. 2020, Mar;75(3):435-444.

ABSTRACT

Study Objective
We conducted a systematic review with meta-analysis to provide an overview of the different manners of providing discharge instructions in the emergency department (ED) and to assess their effects on comprehension and recall of the 4 domains of discharge instructions: diagnosis, treatment, follow-up and return instructions.

Methods
We performed a systematic search in the PubMed, EMBASE, Web of Science Google Scholar and Cochrane databases for studies published before March 15, 2018. A quality assessment of included articles was performed. Pooled proportions of correct recall by manner of providing discharge instructions were calculated.

Results
A total of 1,842 articles were screened and after selection 51 articles were included. Of the 51 included studies, 12 used verbal discharge instructions only, 30 used written discharge instructions, and 7 used video. Correct recall of verbal, written, and video discharge instructions ranged from 8% to 94%, 23% to 92% and 54% to 89%, respectively. Meta-analysis was performed on data of 1,460 patients who received verbal information only, 3,395 patients who received written information, and 459 patients who received video information. Pooled data showed differences in correct recall, with, on average, 47% for patients who received verbal information (95% confidence interval 32.2% to 61.7%), 58% of patients who received written information (95% confidence interval 44.2% to 71.2%), and 67% of patients who received video information (95% confidence interval 57.9% to 75.7%).

Conclusion
Communicating discharge instructions verbally to patients in the ED may not be sufficient. Although overall correct recall was not significantly higher, adding video or written information to discharge instructions showed promising results for ED patients.

INTRODUCTION

To ensure that patients are discharged safely, it is important that they have a good understanding of their diagnosis, treatment, follow-up and return instructions. Therefore, giving patient discharge instructions is an important task of health care professionals in the emergency department (ED).
In a planned and structured situation, such as an outpatient clinic, patient education may already be challenging. In the ED, patient education is even more difficult because of multiple factors.
First, a visit to the ED is mostly an unplanned, unexpected, and therefore stressful situation for the patient. Frequently, patients have acute onset of pain and are worried about their health, which makes it difficult to focus on the provided information. Second, the ED can be crowded and hectic with a high workload for the healthcare professionals. The patient instructions, frequently consisting of new and complex information, is often briefly explained, and can therefore be difficult for patients to remember or reproduce [1]. Third, patient related-factors, like a language barrier, impaired cognitive function or low-literacy, can complicate patient education[2]. Fourth, disease specific symptoms can also impede recall, for example in patients with mild traumatic brain injury[3].
Multiple studies have shown deficits in comprehension of discharge instruction [4-6]. For example, Engel et al. showed that a mere 13% of patients understood each of the 4 major domains of discharge instructions (diagnosis and cause, care given in the ED, care after the ED visit, and instructions on when to return to the ED) [6].

Various studies have investigated patient education with a range of communication tools, and their results suggest that type of communication may influence correct recall of patients. To better understand and quantify the differences in patients' comprehension of discharge information, a literature synthesis is needed. Our primary objective was to perform a systematic review with meta-analysis to provide an overview of the different manners of providing discharge instructions in the ED and to assess their effects on comprehension and recall of diagnosis, treatment, follow-up and return instructions.

MATERIALS AND METHODS

Study Design

We conducted a systematic review following the PRISMA guidelines[7]. We registered the design of this systematic review in PROSPERO[8], with registration number CRD 42018093700.

Selection of Participants and Data Collection and Processing

We performed a systematic search in the PubMed, EMBASE, Web of Science Google Scholar, and Cochrane databases. The information specialist from the Academic Library of the Erasmus Medical Center Rotterdam assisted in developing an extensive literature search. The search terms are listed in Appendix 1. Articles about discharge instructions in the ED that measured recall were included, independently of patient characteristics. We included randomized controlled trials, retrospective and prospective cohort studies, cross-sectional studies and time-series

studies published before March 15, 2018. Articles not written in English were excluded.
Articles were first selected according to title and abstract by 2 independent reviewers (A.E.H and S.C.P.A). Then, final selection was made on articles' full text. In case of disagreement, a third researcher (J.A.H.) decided whether to include or exclude the debated article. References from selected articles were checked for relevant articles. For each included study, we extracted information on the participants (number, age, sex, education level and language barrier), manner of patient education (verbal, written, video, and/or telephone), way of measuring correct recall, percentage of correct recall, and domain of patient education in which correct recall was measured. The checklist of the Cochrane Library was used to assess the quality and risk of bias of each included article. Articles were judged on selection bias, performance bias, detection bias, attrition bias and reporting bias and a conclusion was made about overall risk of bias for each article.[9]

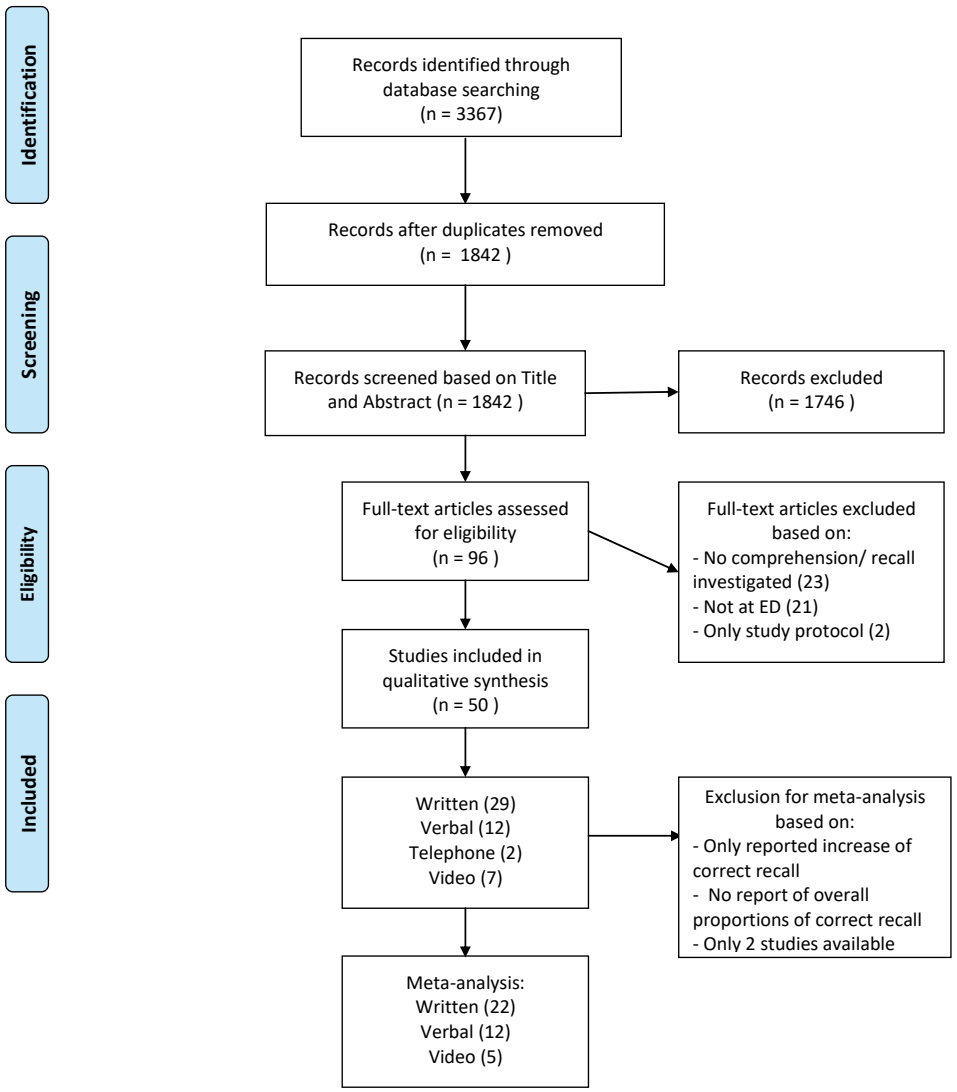
Outcome Measures
The outcome measure of our study was comprehension and recall of discharge instructions after the ED visit. Discharge instructions were subdivided into 4 domains: diagnosis, prognosis, treatment and return instructions. Comprehension and recall of discharge instructions were determined by manner of providing discharge instruction.

Primary Data analysis
Manner of providing discharge instructions (information on diagnosis, treatment, follow-up and/or return instructions) was categorized into verbal, written, video, and telephone discharge instructions. For each of these categories pooled correct recall was determined, expressed by percentage of patients who could correctly recall discharge instructions. We followed a step-by-step guide to perform a meta-analysis by manner of providing discharge instructions using a random-effects model in a an Microsoft Excel spreadsheet.[10] We used spreadsheets capable of producing customized forest plots that were developed by Neyeloff et al. to generate the forest plots. Studies that reported only increase of correct recall or studies that did not report overall proportions of correct recall were excluded from the calculation of pooled estimates of correct recall. A meta-analysis was not conducted for discharge instructions by telephone because only 2 studies were available.
We used the I^2-statistic to assess the percentage of variation across studies that is due to heterogeneity rather than chance.[11] An I^2 value of 25% or lower is associated with low heterogeneity, 50% is associated with moderate heterogeneity, and 75% or higher is associated with high heterogeneity.[11] Subsequently, we compared the pooled correct recall and confidence intervals (CIs) of verbal, written, and video discharge instructions. We used CIs to assess whether correct recall by manner of providing discharge instructions was statistically significant.

RESULTS

The search resulted in 1,842 articles, after selection, 51 met the inclusion and exclusion criteria (Figure 1). Of the 51 included studies, 12 used verbal discharge instructions only[12-23], 30 used written discharge instructions[3, 5, 6, 24-51], 7 used video[52-58] and 2 used telephone[59, 60] discharge instructions. Of these, 33 were observational cross-sectional studies and 18 were randomized controlled trials.

Figure 1: Flowchart



The quality assessment of the included studies is shown in appendix 2 (tables 1-4). We assessed articles according to their way of generating comparable groups and found several randomized controlled trials [24, 47, 54, 56, 57] and 6 2-phase cohort trials [3, 22, 35, 48, 51, 58] to have a high risk of bias. Because of a significant percentage of patients lost to follow-up, we judged 14 articles [3, 15, 21, 25, 30, 34, 37, 44-46, 52, 54, 58, 59] to have a high risk of incomplete data. Twenty articles did not describe the level of education [6, 15, 17, 20-22, 24, 27, 29, 35, 39, 44, 46, 48, 52, 53, 55, 58-60] and 9 articles did not mention whether there was a language barrier [12, 15, 23, 25, 35, 43, 44, 51, 60] and therefore probably had selection bias.

Most studies assessed recall of discharge instructions in 4 domains: diagnosis, treatment, follow-up instructions, and return instructions. Recall was measured in different ways throughout the different studies, for example by face-to-face interview, telephone interview, or written questionnaire.

Verbal discharge instructions

All patients discharged from the ED normally receive verbal discharge instructions. We found 12 studies that investigated recall of verbal discharge instructions. In these studies, correct recall of such instructions differed widely from 8% to 94% (Appendix 2, Table 1).[12-23]

In various studies one or more of the different domains of patient education were investigated. For example, a single-center cross-sectional study demonstrated that 66% of patients had a fair or poor understanding of discharge instructions in at least one domain of discharge instructions.[16] Another cross sectional found that the most accurate recall was on domain of diagnosis; this was correct in 82% of patients, whereas only 43% of patient could correctly recall discharge instructions in all 4 domains.[15] Complete understanding of their diagnosis was reported for only half of the patients.[18]

In a study that specifically investigated knowledge of prescribed medication by questionnaire, none of the questions were answered correctly in 37% of patients. Fifty-seven percent of patients could recall the purpose of the medication, and 62% could recall when to take the medication. Only 8% of patients could answer all questions on medication use correctly.[12]

In regard to follow-up instructions of all adult patients in the study of Qureshi et al, 94% who were advised to consult their General Practitioner after their ED visit could recall this advice correctly[17].

In general there seems no correlation between the number of domains measured in the different studies and correct recall. Studies investigating 4 domains, showed correct recall in 19.9% to 67%[14, 20]. Studies investigating only one domain showed correct recall in 25.3% to 94%[12, 17]. However, according to one study, recall seemed better if just one simple instruction was given to a patient [17].

Griffey et al studied a special conversation technique used with verbal instructions, the teach-back method whereby a patient is asked to ‘teach-back’ the information received from a caregiver in order to receive clarifying feedback from him or her. They found a significant improvement in comprehension of follow up instructions of 31%, but no significance difference in comprehension of diagnosis and treatment.[13] However, a more recently prospective before-after study found that the teach-back method had an improvement of recall of 15% in all aspects of discharge instructions, regardless of patient age and education level.[19]

One study showed that if the verbal instructions were supported by illustrations on a tablet, understanding of diagnosis and treatment improved significantly.[14]

Pediatric patients
Four studies specifically investigated verbal discharge instructions for parents of children discharged from the ED. Waisman et al. found correct recall of discharge instructions in 75% of parents. However, Chappuy et al. found that only 20% of parents understood all domains of discharge instructions correctly and recall was less when parents thought their child was in pain. [20] Two studies found that verbal instructions improved recall significantly if added to written discharge instructions. [21, 22]

Written discharge instructions
Twenty-nine studies investigated recall of written discharge instructions. Most studies showed that adding verbal instructions improved correct recall of discharge instructions significantly with 7 to 31% (Appendix 2, Table 2).[25, 26, 33, 34, 61] Nonetheless, several studies showed a wide range of incorrect recall in at least one domain varying from 23% to 92%. [6, 27, 29, 32, 37, 39]
Four studies specifically investigated elderly patients. For example, Hastings et al. found that 43 to 56% of patients did not understand return instructions completely.[43, 44] They found improvement on recall of medication knowledge if written instructions were individualized instead of pre-printed in a standard format. [45] Even with written discharge instructions, patients with cognitive impairment were less likely to correctly recall the discharge instructions than patients without cognitive impairment.[41]
To improve patients' recall, written discharge instructions could be optimized. A randomized controlled trial that compared written instructions with and without illustrations showed that adding illustrations improves correct recall significantly.[24, 28] If written information is simplified correct recall improves significantly. [30, 38]
Another factor influencing correct recall of written discharge instruction is health literacy. Patients with a low health literacy had less understanding of discharge instructions than patients with high literacy.[36]

Pediatric patients
Studies investigating parents of children discharged from the ED with written instruction found that when combining verbal and written information correct recall was better than when using verbal or written only [3, 47, 48], especially for treatment discharge instructions.[51] Although 93% of parents thought they understood the discharge instructions about diagnosis of their child, there was incorrect recall in 22% of parents. [49] Another study found 32% incorrect recall about treatment of their child even after receiving written discharge instructions.[62] A study using story telling (written experiences from other parents) as communication tool showed no difference in correct recall.[42]

Video discharge instructions
Seven studies investigated recall of video discharge instructions. Discharge instructions using an information video improved recall significantly (appendix 2, table 3).[52, 54] Nonetheless these studies showed a wide range of correct recall in at least one domain varying from 54% to 89%. For example Chakravarthy et al. showed improvement from 65% to 82% correct recall using a discharge video.[53]

Pediatric patients
Most studies using a video were targeted at parents of children discharged from the ED. The parents showed significant improvement in knowledge of the diagnosis and treatment compared with those who did not see the information video.[55-58]

Discharge instructions by telephone
Two studies investigated recall of discharge instructions by telephone. These studies showed that adding telephone follow-up to standard discharge instructions did not improve correct recall in elderly patients and parents of children (Appendix 2, Table 4). [60, 63]

Pooled correct recall
A meta-analysis was performed on data of 1,460 patients who received verbal information only, 3,395 patients who received written information and 459 patients who received video information. Figures 2 to 4 provide an overview of the overall pooled correct recall of verbal, written and video discharge instruction. Variation in correct recall was moderate across studies on video discharge instructions (I^2=50.1%) and high across those on verbal and written discharge instructions (verbal: I^2=95.6%; written: I^2=97.7%). The highest pooled recall were estimated for video discharge instructions (number of studies = 6, pooled correct recall: 66.8%, 95% confidence interval (CI) 57.9%-75.7%) and written discharge instructions (number of studies = 22, pooled correct recall: 57.8%, 95% CI 44.2%-71.2%). The pooled correct recall of verbal discharge instructions was 47.0% (number of studies = 11, 95% CI 32.2%-61.7%).

Figure 2: Forest plot of pooled correct recall rates of verbal discharge instruction.

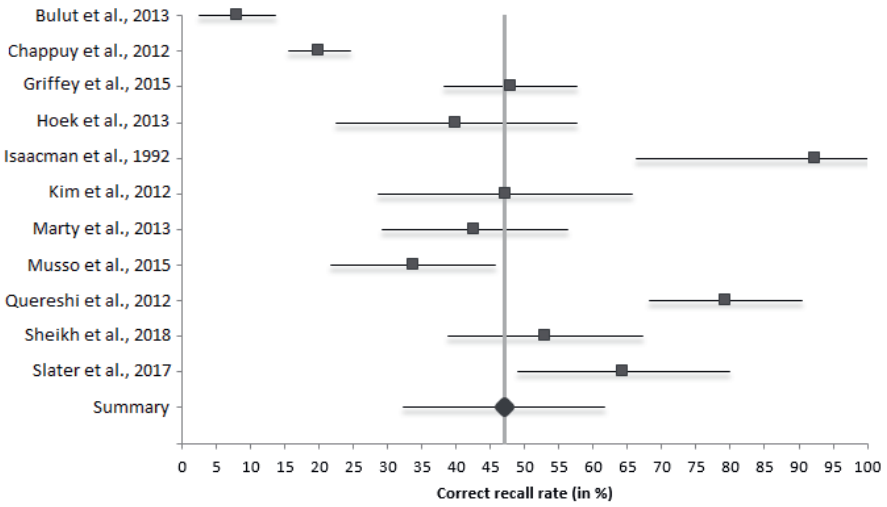


Figure 3. Forest plot of pooled correct recall rates of written discharge instruction.

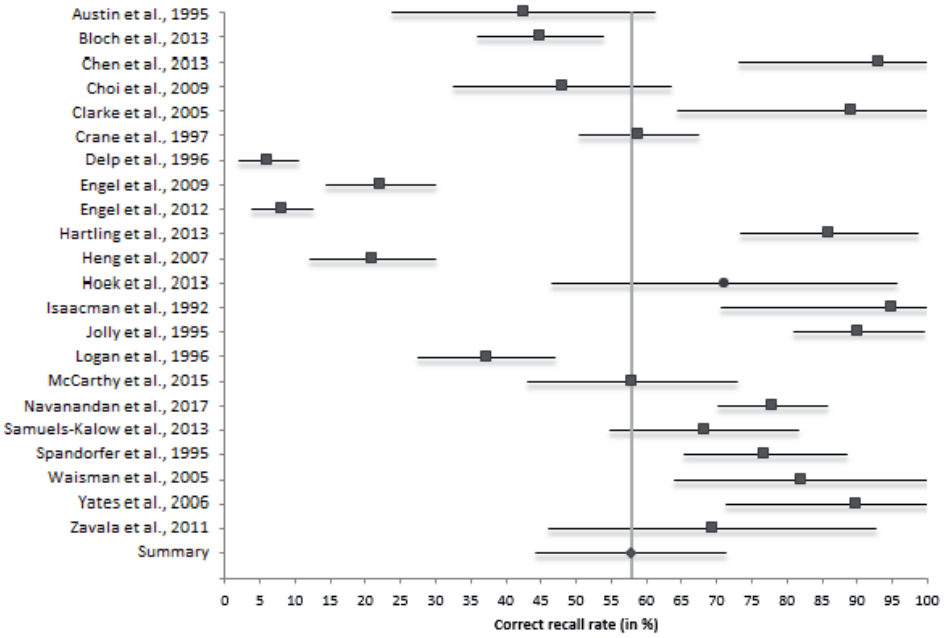
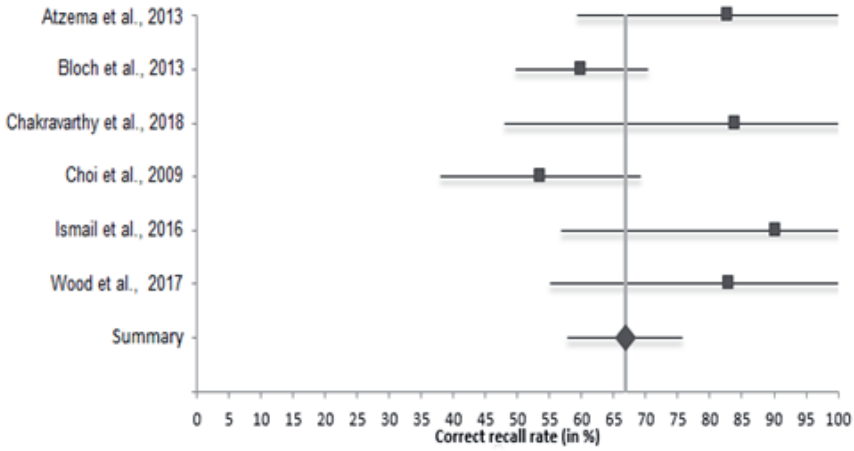


Figure 4. Forest plot of pooled correct recall rates of video discharge instruction.



LIMITATIONS

This systematic review has several limitations. First, the included studies are difficult to compare because of the variety in methods for discharge instructions, different ways of measuring and different definitions of recall, and heterogeneity in patient populations. For example, studies have used different follow-up periods to measure recall. It has been shown that duration between providing discharge instructions and measuring recall influences outcome. [64] This might influence the results of the meta-analysis, although the ED patient population is very heterogeneous and patients must receive discharge instructions based on the best available evidence.
Second, not all included studies were of the same quality, nevertheless in the group of verbal, written and video discharge instructions there were enough articles of relatively good quality to draw conclusions.
Third, our review focused on correct recall of diagnosis, treatment, follow-up and return instructions. We did not investigate whether correct recall influences patients' symptoms, recovery, or both. For future studies, we recommend studying the health benefits of correct recall of discharge instructions in the ED.

Fourth, we categorized the included articles in the manner of discharge instructions (verbal, written, video or telephone), however, discharge instructions are seldom provided in isolation. Although not measured in all the studies, the effect of verbal discharge instructions might influence the other manners of discharge instructions.

DISCUSSION

To our knowledge, this is the first systematic review with a meta-analysis about discharge instructions and their effect on correct recall in the ED. We distinguished 4 types of discharge instructions; verbal only, written information, video and telephone follow-up. It is essential to differentiate between those types to determine the optimal way to provide discharge instructions so ED patients can be discharged home safely.
Verbal discharge instructions are part of standard care, although the results of our review showed that correct recall with this manner could be as low as 8%. Training of providers of discharge instructions on communication with the teach-back method might improve recall.

Our findings suggest that adding written information to standard care could improve recall from 47% to 58% on average. This result is comparable to those of studies in other research fields, for example in rheumatic patients who received colchicine treatment and for patients who underwent cataract or hip surgery. [65-67]
The overall correct recall of adding a video to the discharge instructions was, although not significant, higher than correct recall in patients who received written instructions. All individual studies showed improvement of recall compared with standard care, with or without written information. This is comparable to other results found in different patient populations.[68, 69]

Although there seems to be a trend toward adding video to discharge instructions as the optimal manner, our meta-analysis showed that recall did not significantly improve. However, comparison between video and written information is hampered by the fact that videos were often used to inform about more complicated topics. For example, information about follow-up appointment after the ED visit is easier to remember than information about diagnosis and treatment.[17, 56] In other fields of medicine, patient education with video shows promising results. For example, a study directed to pregnant women that investigated patient education on influenza vaccination showed that women who were shown an instruction video in addition to verbal information had significantly better understanding of the information about influenza vaccination compared with the women who only received verbal information from a physician.[69] Furthermore, a study on patients with atrial fibrillation showed significant improvement of knowledge of atrial fibrillation when a video was added to verbal instructions compared to verbal instructions only.[70] More research is needed to investigate recall of video discharge instructions on the ED population, particularly in specific patient populations, such as patients with low health literacy. A study among patients with low literacy showed a significantly better understanding of information about screening for colorectal cancer when animations combined with spoken text were used compared with written text only.[68] Moreover, the health benefit of correct recall of discharge instructions needs further investigation.
Heterogeneity in patient-population-related and patient-related factors, such as low health literacy or language barrier, may have contributed to the wide variation in correct recall by manner of discharge instructions. A study with volunteers from an outpatient clinic showed that health literacy might negatively influence understanding and recall of discharge instructions[2]. Because there were only a few articles reporting the effect of health literacy in the ED, we were not able to draw conclusions about

the effect of health literacy on correct recall of discharge instructions. A language barrier might prohibit correct recall of discharge instructions.[71] However, in most studies included in this review, a language barrier was an exclusion criterion for enrollment in the study, so we were not able to provide an overview of the effect of language barrier on ED discharge instructions.
Other factors influencing recall of information as described in other areas of medical education may also be present in different levels for each patient; for example, emotional state during education, pre-existing health status and amount of information [72]. However, the included studies provided no information about these factors.

Communicating discharge instructions verbally to patients in the ED may not be sufficient. Although overall correct recall was not significantly higher, adding video or written information to discharge instructions showed promising results for ED patients. Further investigation is necessary to evaluate the effect of written and video discharge instructions on recall, including study of the health benefits of correct recall of discharge instructions in the ED.

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APPENDIX 1 - SEARCH TERMS

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('patient education'/de OR 'verbal communication'/de OR 'written language'/de OR internet/de OR comprehension/de OR 'mobile phone'/de OR 'medical information'/de OR 'interpersonal communication'/de OR 'health literacy'/de OR 'information technology'/de OR telephone/exp OR 'text messaging'/de OR (((patient* OR discharge* OR postdischarge* OR predischarge*) NEAR/3 (educat* OR communicat* OR miscommunicat* OR instruct* OR video* OR underst* OR misunderst* OR comprehension* OR phone* OR telephone* OR smartphone* OR webbase* OR web-base* OR advice* OR Email* OR E-mail* OR handout* OR hand-out* OR leaflet* OR flyer* OR 'text messag*'))):ab,ti) AND ('emergency ward'/de OR 'emergency health service'/de OR 'hospital emergency service'/de OR 'emergency physician'/de OR 'emergency medicine'/de OR 'emergency care'/de OR ((emergen* NEAR/3 (department* OR ward* OR physician* OR medicine*)) OR ed OR a-and-e OR a-e):ab,ti) AND ('hospital discharge'/de OR aftercare/de OR (discharge* OR postdischarge* OR predischarge* OR aftercare* OR after-care* OR after-ed OR after-emergency):ab,ti) NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/lim) AND [english]/lim

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(Patient Education as Topic/ OR Patient Education Handout/ OR Communication/ OR Consumer Health Information/ OR exp Internet/ OR Comprehension/ OR Professional-Patient Relations/ OR Health Literacy/ OR Information Technology/ OR exp Telephone/ OR Text Messaging/ OR (((patient* OR discharge* OR postdischarge* OR predischarge*) ADJ3 (educat* OR communicat* OR miscommunicat* OR instruct* OR video* OR underst* OR misunderst* OR comprehension* OR phone* OR telephone* OR smartphone* OR webbase* OR web-base* OR advice* OR Email* OR E-mail* OR handout* OR hand-out* OR leaflet* OR flyer* OR text messag*))).ab,ti.) AND (Emergency Medical Services/ OR Emergency Service, Hospital/ OR Emergency Medicine/ OR ((emergen* ADJ3 (department* OR ward* OR physician* OR medicine*)) OR ed OR a-and-e OR a-e).ab,ti.) AND (hospital discharge/ OR aftercare/ OR (discharge* OR postdischarge* OR predischarge* OR aftercare* OR after-care* OR after-ed OR after-emergency).ab,ti.) NOT (letter* OR news OR comment* OR editorial* OR congres* OR abstract* OR book* OR chapter* OR dissertation abstract*).pt. AND english.la.

Cochrane CENTRAL 221
((((patient* OR discharge* OR postdischarge* OR predischarge*) NEAR/3 (educat* OR communicat* OR miscommunicat* OR instruct* OR video* OR underst* OR misunderst* OR comprehension* OR phone* OR telephone* OR smartphone* OR webbase* OR web-base* OR advice* OR Email* OR E-mail* OR handout* OR hand-out* OR leaflet* OR flyer* OR 'text messag*'))):ab,ti) AND (((emergen* NEAR/3 (department* OR ward* OR physician* OR medicine*)) OR ed OR a-and-e OR a-e):ab,ti) AND ((discharge* OR postdischarge* OR predischarge* OR aftercare* OR after-care* OR after-ed OR after-emergency):ab,ti)

Web of science 605
TS=(((((patient* OR discharge* OR postdischarge* OR predischarge*) NEAR/2 (educat* OR communicat* OR miscommunicat* OR instruct* OR video* OR underst* OR misunderst* OR comprehension* OR phone* OR telephone* OR smartphone* OR webbase* OR web-base* OR advice* OR Email* OR E-mail* OR handout* OR hand-out* OR leaflet* OR flyer* OR "text messag*")))) AND (((emergen* NEAR/2 (department* OR ward* OR physician* OR medicine*)) OR "ed" OR "a-and-e" OR "a-e")) AND ((discharge* OR postdischarge* OR predischarge* OR aftercare* OR after-care* OR "after-ed" OR after-emergency))) AND DT=(article) AND LA=(english)

Google scholar
"patient|discharge|postdischarge|predischarge education|communication|instruction|video|handout|leaflet|flyer" "emergency department|ward|physician|medicine" discharge|postdischarge|predischarge|aftercare|"after-care"

APPENDIX 2

Table 1: Overview of the included articles about verbal discharge instructions.

Author	Year	Country	Study design	N (% participation rate)	Subgroup	Domain of recall	Correct recall	Risk of Bias
Bulut*	2013	Turkey	Prospective cohort	100 (not mentioned)	Adults	T	37% had no knowledge at all about prescribed medication, of the others: 61.9% had information about when to take the medications; 57.1% had knowledge about the purpose of the medication; 52.3% knew about the dosage of the medications; and 25.3% had knowledge about the course of the medications. Correct recall in all areas was 8%.	High risk
Griffey*	2015	USA	RCT	408 (64%)	Adults	DFRT	Comprehension of post-ED self-care in teach-back group (N=212) was 62% vs 48% in control group (N=196) (p=0.02) and post-ED follow-up 70% vs 39.8% (p<0.001). No difference in comprehension of diagnosis or treatment	Low risk
Kim*	2012	Korea	RCT	106 (95%)	Adults	DFRT	47% correct answers in the conventional (N=53) group vs 67% in the tablet group (N=53) (p<0.01)	Low risk
Marty*	2013	Switzerland	Prospective cohort	89 (79%)	Adults	DFRT	43% correct recall of all domains. The most accurately remembered information was related to the diagnosis (82%) and to follow-up treatment (72%) as well as to the purpose of drugs prescribed (64%)	Intermediate risk
Musso*	2015	USA	Prospective cohort	89 (not mentioned)	Adults	DFRT	65.9% of patients demonstrated less than good understanding in at least 1 domain. Correct recall in all domains 34.1%	High risk
Qureshi*	2012	Australia	Prospective cohort	247 (98%)	Adults	F	53% did not follow-up with a GP. 94% could recall they had to see a GP	Low risk
Sheikh*	2018	Canada	Two phase cohort	100 (3%)	Adults	D	47% had incomplete understanding of diagnosis and 29% had no understanding of diagnosis. Correct recall in 53%	Low risk

Slater*	2017	USA	Two phase cohort	209 (40%)	Adults	DFRT	The mean recall correct in the teach-back phase (N=105) was 15% higher than the pre-intervention (N=104) (64.6% vs. 79.4%, p < 0.05). The largest increase of correct recall was seen in the diagnosis group (49.0% to 78.1%, p < 0.05)	High risk
Chappuy*	2012	France	Prospective multicenter study	380 (100%)	Parents	DFRT	19.9% of parents understood all four items. Least well-understood items were reason for admission (55.6%) and seriousness of child's state of health (48%)	Low risk
Patel	2009	USA	Prospective cohort	325 (92%)	Parents	R	Correct recall of warnings signs in 47% in the standard care (N=133) group and 61% in the intervention group (N=192)	High risk
Thomas	2018	USA	Prospective cohort	192 (52%)	Parents	FR	Parents who received verbal instructions were significantly more likely to recall those instructions than did parents who did not receive verbal instructions (67% vs 44%; P < .05)	Intermediate risk
Waisman	2003	Israel	Prospective multicenter study	482 (67%)	Parents	DT	75% fully understood the ED discharge instruction about diagnosis, and 84,5% understood fully the treatment instructions.	Intermediate risk

D=diagnosis, T=treatment, F=follow-up, R=return instructions. *Used in meta-analysis

Table 2: Overview of the included articles about written discharge instructions.

Author	**Year**	**Country**	**Study design**	**N (% participation rate)**	**Subgroup**	**Domain of recall**	**Correct recall**	**Risk of Bias**
Austin^	1995	USA	RCT	101 (not mentioned)	Adults	FRT	Five or more correct responses in 65% in the written with illustration group (n=54) vs 43% in the written without illustration (n=47) group. (p=0.033).	High risk

Chen^	2013	Taiwan	RCT	322 (55%)	Adults	FRT	In the experimental group (n=89) 93% of questions were answered correctly vs 86% in control group (n=89) (p<0.05)	Intermediate risk
Clarke^	2005	Toronto	Prospective cohort	74 (83%)	Adults	DFRT	The mean comprehension percentage on the four domains was 68%. (24% received verbal instructions only n=18, 73% handwritten instructions n=54, 3% pre-printed instructions n=2)	Intermediate risk
Crane^	1997	USA	Prospective cohort	314 (77%)	Adults	DFRT	The average correct recall was 59% on four domains	Intermediate risk
Delp^	1996	USA	RCT	234 (90%)	Adults	FRT	Complete correct recall in 46% in written with cartoon group (n=105) and in 6% in written without cartoon group (n=129).	Intermediate risk
Engel^	2012	USA	Prospective cohort	159 (83%)	Adults	DFRT	Level of understanding was determined according to the concordance between direct patient recall and ED chart review. 92% demonstrated a deficit in at least one domain, 66% severe deficit in at least one domain, 33% more than one domain with severe deficit. Correct recall in 8%	Low risk
Engel^	2009	USA	Multicenter cohort	140 (48%)	Adults	DFRT	78% of patients demonstrated deficient comprehension (less than complete concordance) in at least 1 domain. Correct recall in 22%	Low risk
Hoek^	2013	Netherlands	Two phase cohort	195 (60%)	Adults	T	Correct recall of advised analgetic medication was 40% in verbal group (n=50) vs 71% in written group (n=45) (P<0.01).	Intermediate risk
Jolly^	1995	USA	Two phase cohort	840 (47%)	Adults	FRT	87% answered correctly in simplified written group (n=440) vs 82% in standard written group (n=400) (p<0.01).	High risk
Lin	2015	USA	Prospective cohort	75 (not mentioned)	Adults	DFRT	Comprehension questions were answered correctly in 30% about diagnosis, in 9% about ED care, in 29% about post-discharge instructions and in 17% about return instructions.	Intermediate risk

Logan^	1996	USA	Prospective cohort	153 (87%)	Adults	DFRT	Correct recall of diagnosis in 79%, of treatment in 49% and of follow up plan in 82%. 37% answered all questions correctly. 8% answered all questions incorrectly.	Low risk
McCarthy^	2015	USA	RCT	274 (98%)	Adults	T	Intervention arm (n=100) had better knowledge of medication side effects (p<0.0001) and were more likely to remember precautions about taking additional acetaminophen than control group (n=110) (38% vs 18%, p=0.001)	Intermediate risk
Reis	2013	Brasil	Two phase cohort	228 (not mentioned)	Adults	DFRT	17% of patients were unaware of the diagnosis. As for the name of prescription drugs, 56% reported drug names correctly, 9% incorrectly and 26% were unaware of such information. 88% could not mention any adverse reaction to the medication prescribed.	High risk
Simmons	2015	USA	Two phase cohort	643 (63%)	Adults	DFRT	The intervention had no effect on the total number of discordances or the total number of discordances plus partial concordances.	High risk
Spandorfer^	1995	USA	Prospective cohort	217 (98%)	Adults	DFRT	23.0% had no understanding of at least one component of the instructions, 4.1% had no understanding of at least two components of the instructions. (Dus dan 100%-23% CR)	Low risk
Yates^	2006	New Zealand	RCT	200 (78%)	Adults	DFRT	Comprehension score with written instructions (n=100) was 90%, and for the simplified written instructions (n=100) was 100% (p<0.0001).	Low risk
Zavala^	2011	USA	Prospective cohort	49 (98%)	Adults	DFRT	31% described a diagnosis related concern that revealed poor comprehension of aftercare instructions. (100-31=69%)	High risk
Hastings	2011	USA	Prospective cohort	92 (99%)	Elderly	DFRT	20.7% did not understand their diagnosis, 16.3% did not understand self-care instructions, 63% did not understand how long their symptoms or illness were expected to last	Intermediate risk

Hastings	2012	USA	Prospective, cohort	305 (77%)	Elderly	DFRT	Perceived understanding of discharge information: 56% understood diagnosis, 48% knew follow-up instructions	Low risk
Al-Harthy	2016	KSA	Cross-sectional study	173 (not mentioned)	Parents	T	On the whole, 55% knew the name and 69% was aware of the dose of medication, versus 91% and 100% in parents who received both verbal and written instructions (only 6.4% of population)	Intermediate risk
Han	2011	USA	Prospective cohort	149 (79%)	Parents	DFRT	Patients with delirium superimposed on dementia had consistently poorer comprehension on their discharge diagnosis, return to the ED instructions, and follow-up instructions compared with patients without any cognitive impairment	Low risk
Hartling^	2013	Canada	RCT	413 (100%)	Parents	DFRT	Recall of intervention group (n=208) 86% vs 84% in control group (n=205) (p= 0.5). At 1-year follow-up 72% vs 70% (nonsignificant)	Low risk
Hayes	1998	USA	RCT	63 (100%)	Parents	T	Knowledge of medication subtest; 30 items. Higher scores reflect less knowledge. Score in individualized written group (n=31) was 47.55 vs 52 in pre-printed written group (n=32) (p=0.016).	Intermediate risk
Heng^	2007	Singapore	Prospective cohort	100 (60%)	Parents	DFRT	Recall of 21% on follow-up instructions. No difference in written/verbal/both	Intermediate risk
Isaacman^	1992	USA	RCT	197 (85%)	Parents	DFRT	Combining the data for the three groups (control (n=84), verbal(n=52), and verbal + written(n=61)), the overall mean percentages of correct responses per parent were 82.9, 92.3, and 95.2, respectively	High risk
Kaestli	2016	Switzerland	Two phase cohort	146 (85%)	Parents	DFRT	Parental knowledge improved significantly with the leaflet (n=79) vs control group (n=67) on all four domains; dose 89.1% vs 62.3% (P<0.0001), frequency 85,5% vs 57,9% (P<0.001), duration 66.7% vs 34.2% (P<0.001), indication 94,9% vs 70,2% (P<0.001)	High risk

Navanandan^	2017	USA	Prospective cohort	495 (17%)	Parents	D	Provider-documented diagnoses from the initial visit and caregiver-reported diagnoses on return visits were discordant in 22.0%, although 92.7% of caregivers explicitly stated they knew their child's discharge diagnosis. Correct recall in 78%	Low risk
Samuels-Kalow^	2013	USA	Prospective cohort	145 (69%)	Parents	T	32% had an acetaminophen dosing error. 54% of Spanish-speaking parents had a dosing error, as compared with 25% of English-speaking parents. Correct recall in 68%	Low risk
Waisman^	2005	Israel	Two phase cohort	382 (67%)	Parents	DFRT	Present study (n=95) 82% had maximum score for overall understanding, compared with 80% in the first phase (n=287)(p=0.54). 73% understood the ED diagnosis, compared with 72%. Level of understanding of treatment instructions was significantly improved in the second phase (92% vs 82%, p=0.025)	High risk

D=diagnosis, T=treatment, F=follow-up, R=return instructions. ^Used in meta-analysis

Table 3: Overview of the included articles about video discharge instructions.

Author	**Year**	**Country**	**Study design**	**N (% participation rate)**	**Subgroup**	**Domain of recall**	**Correct recall**	**Risk of Bias**
Atzema♦	2013	USA	RCT	133 (71%)	Adults	DFRT	83% answered correctly in video group (n=58) vs 70% in control group (n=75) (p=0.02)	Low risk
Chakravarthy♦	2018	USA	RCT	55 (80%)	Adults	T	82% of questions about treatment were answered correctly in video group (n=25) vs 65% in verbal group (n=27)	Low risk
Choi♦	2009	Korea	RCT	161 (85%)	Adults	TR	In the video group (n=84) 54% of the questions about treatment and return instructions were answered correctly vs 48% in written group (n=77) (p<0.05)	High risk
Baker	2009	USA	RCT	280 (94%)	Parents	DFRT	Difference between pre- and posttest about knowledge of childhood fever: Intervention group (n=140) 56% improvement (p<0.0001) vs no difference in control group (n=140).	Low risk

Bloch♦	2013	USA	RCT	436 (84%)	Parents	DFRT	Recall on four domains in video group (n=220) 60% vs 45% in written group (n=216) (P<0.05)	Intermediate risk
Ismail♦	2016	USA	RCT	71 (89%)	Parents	DFRT	Posttest scores about comprehension of diagnosis, disease process and post-care was 89% in the Intervention group (n=31) vs 76% in control group (n=32) (p<0.0001)	High risk
Wood	2017	USA	Two phase cohort	83 (not mentioned)	Parents	DFRT	Difference between pre- and posttest: 13% in video group (n=41) vs 6% verbal + written group (n=41), p=0.027).	High risk

D=diagnosis, T=treatment, F=follow-up, R=return instructions. ♦Used in meta-analysis

Table 4: Overview of the included articles about telephone discharge instructions.

Author	Year	Country	Study design	N (% participation rate)	Subgroup	Domain of recall	Correct recall	Risk of Bias
Biese	2014	USA	RCT	178 (87%)	Elderly	TF	90% filled prescription and knew medication name, dosage and indication. Overall 86% scheduled FU appointments. The intervention group (n=39) was 1.8 time more likely than the control (n=46) and placebo group (n=35) combined to see a physician within 5 days (p-0,04)	Low risk
Khan	2004	Australia	RCT	310 (86%)	Parents	D	Asthma knowledge score in standard care (130): 63% baseline to 70% at follow-up (p=0.001), intervention (n=136) 67% at baseline to 77% at follow-up (p=0.001). No significant difference between the groups	High risk

D=diagnosis, T=treatment, F=follow-up, R=return instructions.

Chapter 3

Effective strategy for improving instructions for analgesic use in the emergency department.

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Eur J Emerg Med. 2013 Jun;20(3):210-3.

ABSTRACT

Pain is a common presenting complaint of emergency department patients. Providing instructions that can be easily recalled by patients is an important step in enabling patients to manage their pain following discharge. The effect of the introduction of written discharge instructions for pain medication on patients' recall of instructions was evaluated in this study. A patient–control study within a prospective follow-up study was performed. In the first phase, no written discharge instructions were available. Patients discharged on analgesics filled in a digital questionnaire regarding correct analgesics use. In the second phase, patients were discharged with additional written instructions and completed the same questionnaire. In the first phase, 40% of patients correctly recalled instructions for taking analgesics. In the second phase, significantly more patients, 71% (P= 0.002), were able to recall the instructions correctly. Results of this study support the hypothesis that it makes sense to provide patients with written instructions about the appropriate use of analgesics, and that emergency departments that are not yet doing this should consider introducing this policy. It is a relatively low-cost measure that could lead to a significant improvement in quality of care.

INTRODUCTION

Pain is a common presenting complaint to the emergency department. Recognition and appropriate treatment of pain have recently been gaining more attention.[1] Correct medication at an adequate dose and following an appropriate schedule are necessary to successfully reduce pain. Following doctors' advice regarding the administration of analgesics is important to ensure therapeutic levels, allowing effective management of the patient's pain.

The extent to which patients follow doctors' advice shows considerable variation.[2] Comprehension of advice has often been identified as an important factor in how likely a patient is to follow a doctor's instructions.[3] Studies have shown that 23-78% of patients had incomplete comprehension of their discharge instructions.[4,5] Risk factors for failure to understand and reproduce discharge instructions include illiteracy and instructions being given in the patient's non-native language. No relation between comprehension and age or education level was found.[4–7] It is suggested that initiatives should be developed to improve patient comprehension of discharge instructions, and thus improve posthospital patient care.[3]

In this study we aim to evaluate a strategy for improving our patients' recall of their instructions for taking pain medication. The effect of the introduction of written discharge instructions for pain medication on patients' recall of instructions for using simple analgesia was studied. In addition, we were able to identify some important factors influencing recall. We also assessed the extent to which patients followed their doctors' advice.

METHODS

A patient–control study within a prospective follow-up design was carried out in two phases. The study was conducted in the ED of a tertiary hospital in Rotterdam (the Netherlands).

In the first phase, during 3 weeks in January 2010, all patients over 18 years of age and discharged on analgesics with verbal instructions only (e.g. paracetamol, nonsteroidal anti-inflammatory drugs and/or tramadol, as reported in patient's file) were eligible to take part. Exclusion criteria were: patients unable to read and speak Dutch, patients with missing data (particularly telephone number), patients who could not be contacted by telephone within 3 days of their ED visit, patients without access to e-mail and patients who refused to take part.

The included patients received a telephone call up to 3 days following their ED visit and were asked to complete an online questionnaire regarding the advice they had been given about analgesia. They then received an e-mail with a link to the online questionnaire. The questionnaire contained questions testing whether patients could correctly recall instructions for taking analgesics. Recall was scored as correct by the researcher if the answers tothe questions matched the instructions written in the patient's file. There were also questions asking what analgesics the patient actually took, and their perceived reason for any differences between their actions and the

instructions given. Demographic information was also collected. During this phase, staff in the ED were not aware of the study to prevent bias.

Following this initial phase, we developed and implemented a short instruction card with written information on taking analgesics. The card was based on the WHO pain ladder [8]. A period of 2 months was needed to introduce the card into the ED. Due to the implementation of the instruction card by the researcher, the doctors were not blinded from this point onward.

In the second phase of the study, during 3 weeks in May-June 2010, all patients who were discharged with the instruction card and regular verbal instructions were invited to complete the same digital questionnaire. Patient recruitment was carried out in the same manner as in the first phase with the same inclusion and exclusion criteria.

Institutional approval was obtained from the research ethics board before the initiation of the study, and all patients gave written consent before participation in the study.

At the end of the study, the data were analyzed using statistical package for social sciences, version 17.0 (SPSS Inc., Chicago, Illinois, USA). The Pearson w2-test for normally distributed variables was used to compare the results of the questionnaire in the two phases. The Mann–Whitney U-test was used if the variables were not normally distributed. A P-value of less than 0.05 was considered statistically significant.

RESULTS

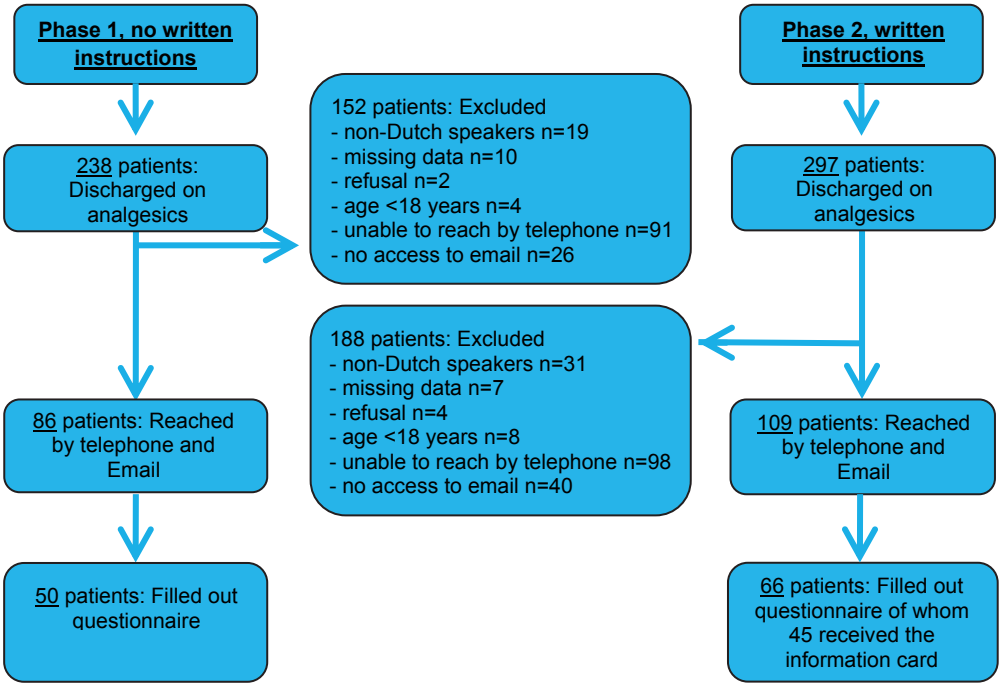
Phase 1 (no written instructions)

Two hundred and thirty-eight patients were discharged on analgesics, and 152 were excluded (non-Dutch speakers n=19; missing data n=10; refusal n=2;
age<18 years n=4; unreachable by telephone n=91; no access to e-mail n=26). Of the remaining 86 patients, 50 patients filled out the questionnaire (response rate 58%) (Fig. 1). Twenty (40%) of these patients were able to correctly recall instructions for taking analgesics. In addition, patients were asked whether they would be interested in a leaflet with instructions for taking analgesics; 56% (n=28) of the participants said yes.

Phase 2 (written instructions)

Two hundred and ninety-seven patients were discharged on analgesics, and 188 were excluded (non-Dutch speakers n=31; missing data n=7; refusal n=4; age<18 years n=8; unreachable by telephone n=98; no access to e-mail n=40). Of the remaining 109 patients, 66 filled out the questionnaire (response rate 61%) (Fig. 1). There were 21 patients excluded who had not received the information card, probably because not all doctors were aware of the study and/or the availability of the information cards. Of the remaining 45 patients, 32 were able to correctly recall instructions for taking analgesics (71%). There was a significant difference between the two groups in how many patients could correctly recall the instructions. (P<0.01; Fig. 2a).

Figure 1: Study flowchart



Between the groups, there were no significant differences in sex, age, education level, follow-up and days between the ED visit and filling out the questionnaire (Table 1). According to patients' files, none of the eligible patients were recorded as being intoxicated during their ED visit. The groups were too small to investigate any differences due to the seniority of the attending doctor (e.g. nonspecialist, specialist-trainee, specialist).

Table 1: Patient characteristics

	No written instructions (n=50)	Written instructions (n=45)	p-value
Male	29 (58%)	25 (56%)	0.81
Age (median and range)	33 year (19-68)	33 year (19-69)	0.76
Number of days between ED visit and filling out the questionnaire (median and range)	3 (1-17)	2 (0-24)	0.82
High level of Education	22 (44%)	27 (60%)	0.21
No outpatient follow-up	30 (63%)	18 (38%)	0.05

(ED= Emergency Department)

In examining possible confounding variables, it was found that there was no influence from sex (P=0.12) or number of days between the ED visit and filling out the questionnaire (P=0.75). However, there was a slight variation because of age; younger patients correctly recalled instructions more frequently than older patients (P=0.01, odds ratio 1.05; Fig. 2b). In addition, the improvement in recall of instructions was significantly higher among patients with a higher education level (bachelor/masters degree) compared with those with a lower education level (P=0.02).

Figure 2a: Patient recall of how to use simple analgesia.

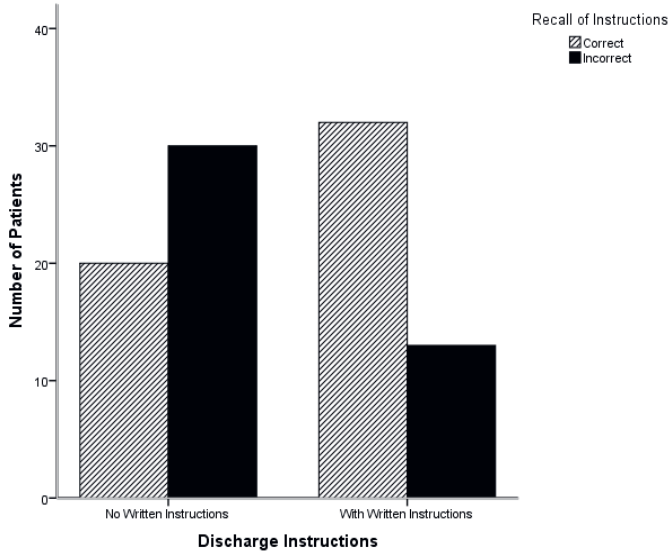
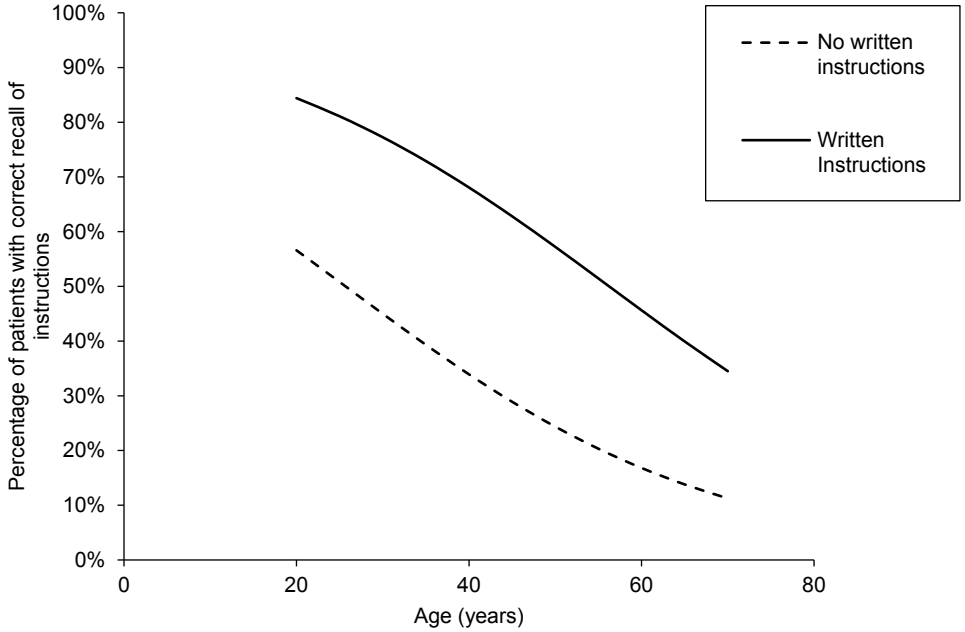


Figure 2a: Recall of instructions for using simple analgesia related to age



Although it was not the primary aim of this study, we analyzed how well patients had followed the instructions given to them. Patients were asked how much and what type of analgesic they had taken. In the group with no written instructions (n=50), 72% (n=36) of patients took less of the advised medication or an alternative, and 30% (n=15) did not take anything. In the written instructions group (n=45), 69% (n=31) took less of the advised medication or an alternative, and 38% (n=17) did not take anything. There was no significant difference between the groups in this respect (P=0.95). The most common reason given for not taking pain medication was that the patient was not in pain.

DISCUSSION

In our study, only 40% of patients were able to recall how to take analgesics correctly after their visit to the ED. With the introduction of an instruction card, a relative increase of 78% of patients could correctly recall how to take simple analgesia. We feel accurate recall and comprehension by patients of doctors' discharge instructions is important for adequate patient care and preventing readmission. To our knowledge, this is the first implementation study on discharge instructions for pain medication in the ED.[9,10] Pain medication is widely used and often available over the counter, and therefore some healthcare personnel may assume that dosage instructions are redundant.

In our study, unlike others, instructions were more likely to be correctly recalled by younger patients than by older patients.[7] Furthermore, we demonstrated (in contrast to others) that the improvement of recall, after the introduction of written discharge instructions, was significantly higher in patients with a higher education level compared with those with a lower education level.[7]

We addressed compliance in our study, although we did not primarily aim to study compliance because we did not expect this would be a good measure of the quality of discharge instructions. Patients can have valid reasons for not taking the analgesics, for taking less than was prescribed or taking them less frequently (e.g. no pain). An interesting finding in our study was that even though patients' recall of how to use simple analgesia was significantly better after the introduction of the written discharge instructions, this had no effect on the number of patients in either group who took less analgesia or used an alternative (72 and 69%, P=0.95).

There are some potential limitations in the design of this study that could limit the interpretation of our results. For example, the discharge instructions given verbally to patients were not standardized or recorded and the groups were too small to study variance due to factors such as the seniority of the doctor. Furthermore, the study was limited to patients with access to an e-mail account. Although in our population the vast majority had access to e-mail, it is possible that not all results can be extrapolated to the ED population. To reduce information bias, the ED staff were not informed about the study during the first phase. However, the introduction of the instruction leaflet and the fact that doctors were not blinded to the study from this point onward may have encouraged doctors to pay more attention to their discharge instructions.

We achieved an improvement of 78% (from 40 to 71%). However, the potential wash-out effect was not studied. Further research is needed to establish whether this improvement has been maintained.

Conclusion

Initially, 40% of studied patients discharged from the ED were able to correctly recall instructions on how to take analgesics. This increased to 71% when patients were discharged with additional written instructions. This study justifies further research because it shows a trend that it may be useful to provide patients with written instructions about the use of analgesics. EDs that are not yet providing written instructions to patients should consider introducing written discharge instructions. It is a relatively low-cost measure that could lead to a significant improvement in quality of care.

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Chapter 4

Effect of written and video discharge instructions on parental recall of information about analgesics in children: a pre/post-implementation study.

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ABSTRACT

Objective
To determine if written and video instructions improved the recall of how to use analgesics correctly in parents of children discharged following assessment in the Emergency Department (ED).

Methods
This was a prospective pre- and post-implementation study set in the EDs of a tertiary teaching hospital and an urban general hospital in the Netherlands. The participants were parents/carers of children under 12 years old that had been assessed in and subsequently discharged from the ED. The pre-implementation phase involved 165 participants; the post- phase involved 174 participants. In the post-implementation phase written instructions about correct analgesic use in children and a link to an online video were provided at discharge.
Endpoints were measured using a questionnaire designed to ascertain participants' recall of how to use analgesics correctly and their patterns of use, completed 3-5 days following discharge of their child from the ED. Additionally, participants were asked about re-attending healthcare services and their satisfaction with and preferences for information about analgesic use.

Results
Recall of the correct use of analgesics was significantly higher in participants in the post-implementation phase compared to the pre-implementation phase (difference 29%;95%CI 19% to 39%). In the post-implementation phase, participants represented to healthcare services less frequently (difference -6%; 95%CI -13% to 0%). Patterns of use of analgesics varied between the pre- and post- phases, with significantly more participants giving analgesics at home (difference 11%; 95% CI 1% to 20%). Participants in the post-implementation phase were significantly more (highly) satisfied about the analgesic advice they received compared to parents in the pre-implementation phase (Difference -13; 95% CI: -23% to -3%). Verbal (93%) or written instructions (83%) were the most popular choices for discharge instructions.

Conclusion
In our study we observed that the recall of the correct use of analgesics was increased in participants who had been given written instructions at discharge.

INTRODUCTION

Children with pain are often undertreated, which can lead to unnecessary discomfort and limitations [73]. Pain management after discharge is challenging for parents and carers. Children can be limited in their ability to verbalise pain, parents and carers find accurately recognising pain difficult. Parents are often fearful of overdosing analgesics and have concerns about addiction and side effects[74].
It has been previously shown that patients and caregivers have an impaired level of comprehension of medical care being given and subsequent discharge instructions[75]. This finding was also mirrored in a recent systematic review which went on to conclude that parents experienced difficulties with ED discharge instructions[76]. Helpfully discharge instructions with alternative teaching interventions, such as videos, can lead to an increase in patients' comprehension of instructions compared to traditional standardised written or verbal discharge instructions [56, 77, 78].

It seems reasonable to presume that recall could play a role in these difficulties. We have previously shown that by providing adult patients with written instructions about the correct use of analgesics at discharge from ED, increased their correct recall of these instructions by 78% [5]. In our current study we investigated if an improvement in the correct recall of analgesic use could also be achieved in the parents or carers of children discharged from the ED using written instructions. In addition to this, we evaluated the role of giving instructions on video and the effect of these interventions on patterns of analgesic use, re-attendance rates to healthcare providers, parental satisfaction and preferences for the delivery of discharge instructions. We hypothesised that written and video parental discharge instructions, including explicit advice about the recommended dosages for analgesics, would improve parents' recall of this information compared to verbal instructions alone (usual care).

METHODS

Study design
Between February 2016 and December 2018, we enrolled participants in this pre/post implementation study at two hospitals in the south of the Netherlands (one tertiary hospital and one urban hospital).

Participants
Participants for the pre- and post-implementation phases were identified from hospital charts. The eligibility criteria were individuals who were the parent or carer of a child aged 0-12 years who attended the ED where the child was discharged to home following assessment/treatment in the ED with an aftercare plan involving analgesia and the parent or carer was able use written and spoken Dutch.
Exclusion criteria were if the participant did not want to take part, their child used analgesics on a regular basis prior to attending the ED, they had previously participated in the study, child abuse had been suspected or, in the post-implementation phase, they had not received the intervention.

Data Collection
Parents/carers in the pre- and post-implementation phase were contacted by telephone within three to five days after the ED visit and were invited to participate. Study information was sent by email with a link to the online questionnaire. If participants did not have access to an email address, the study information and questionnaire were sent by post. Participants were reminded after one week (by email) and two weeks (by telephone) to complete the questionnaire.

Intervention
In the ED standard care at discharge was to provide verbal instructions on the use of analgesics and when required, a written prescription. Our intervention was a leaflet containing written instructions on analgesics and a link to an online video, in addition to the standard care. The leaflet provided general information about pain (the aetiology of pain, how to recognise pain in children, the importance and safety of analgesics) and specific information about dosing and scheduling of analgesics according to the child's weight. This information was based on the local pain protocol for children and national guidelines about analgesic use [79]. The leaflet was developed by a multidisciplinary team of physicians with experience in treating children with pain in the ED. This team consisted of emergency physicians, paediatricians, a paediatric anaesthetist and a paediatric surgeon. Semi-structured interviews in a subset of parents (n=10) also contributed to the development of the leaflet.
The video about analgesic use was developed by the multidisciplinary team in cooperation with a production company with experience in patient education. The script and final version of the video were also reviewed by a group of parents. This video emphasised the correct use of analgesics, the value of analgesics and aimed to refute prejudices about analgesic use, complimenting the information in the leaflet. A link to the online video was provided on the written information leaflet. (https://sehzorg.nl/pijnstillingkinderen)

Professionals
During implementation all physicians who treated patients in the ED were educated about the use of the leaflet during teaching sessions. Visual reminders to provide patients with the leaflet were placed in the ED. Subsequently, in the post-implementation phase a questionnaire was distributed among the physicians to evaluate the acceptability of the implementation of the written discharge instructions.

Primary and secondary endpoints
The primary endpoint of the study was to quantify the correct recall in participants of information about analgesics. Questions about the instructions for using analgesics were used to assess if the participant was able to correctly recall the advice that had been given in the ED. If the participant recorded in the questionnaire the correct medication, dosage and frequency this was scored as "correct recall". In the case of an error in one or more items, it was scored as "incorrect recall".
To identify possible confounders of correct recall, items regarding participant and patient characteristics were collated (see table 1). The pain score of the child on arrival in the ED and the pain score at discharge were recorded from the child's ED chart. In the ED, for children who could point out their pain score themselves, a Numeric Rating Scale (NRS) was used for measuring their pain. For younger

children the Visual Analog Scale was used, or the nurse's assessment was extrapolated to the NRS.
Our secondary endpoints examined the pattern of use of analgesics following discharge, (including how often, when and how long), rate of re-attending healthcare services for the initial complaint (general practitioner, outpatient clinic or ED), satisfaction with the discharge instructions (on a 5-point Likert scale) the preferred manner of discharge instructions and whether the participants had watched the online video.
Secondary endpoints also included the acceptability of the implementation amongst the physicians. This was measured using the modified Ottawa Acceptability of Decision Rules Instrument (OADRI) [80]. The OADRI is a 12-item instrument of questions about the intervention and about the implementation of the intervention.

Ethics
Ethical approval was obtained from the research ethics board before start of the study (MEC-2016-051). All participants gave informed (implied) consent by submitting completed questionnaires. The study was registered in the Netherlands Trial Registration (NTR-5822).

Statistical analyses
We performed a sample size calculation with a power of 0.80 with a P value of <.05. The sample size estimation was based on a correct recall in usual care of 40% [5]. Based on a careful estimation of literature we expected an increase in correct recall of 15%, requiring with power of 0.80 and a p-value of <0.05 [5, 81, 82]. This resulted in a sample of N = 163 patients per group. We compared the baseline characteristics of the participants of the pre-implementation phase with those of the post-implementation phase. Categorical data were analysed using a Chi-square test (e.g. gender, educational level, family composition, diagnosis at discharge). Continuous data (e.g. age, pain score at entry and pain score at discharge) were analysed using the independent samples-t-test (if the data were normally distributed) or the Wilcoxon Rank Sum Test (if the data were not normally distributed).
The number of parents that recalled correctly prescribed analgesics in the two groups was compared using a Chi-square test. To determine which characteristics were associated with correct recall uni- and multivariate logistic regression analyses were performed with the dichotomous variable correct recall as the dependent variable for the two groups separately. Characteristics with a significance level of $p<0.20$ in univariate analyses were entered into the multivariate model. The significance level was set at $p<0.05$.
Secondary endpoints of analgesic use at home, re-attending healthcare services and participant satisfaction, were analysed with Chi-square test for categorical variables and with an unpaired t-test for continuous variables. Descriptive analysis was used to determine the acceptability of the implementation, using the OADRI.
All analyses were performed in SPSS version 25.

RESULTS

In the pre-implementation phase 431 charts were screened, of which 267 met the inclusion criteria. Responses were received from 165 participants. In the post-implementation phase 1,962 charts were screened, of which 1,200 met the inclusion criteria. Responses were received from 691 participants but 517 had to be excluded because they had not received the intervention (figure 1). The response rates in the pre- and post- phase were comparable, 62% (95%CI: 56% - 68%) vs. 58% (95%CI: 55% - 60%).
Baseline characteristics were broadly similar in both groups (table 1) except that there were more women in the post-implementation group (difference -13%; 95%CI: -30% to -17%). The participants' children seen in the ED during the post-implementation phase had higher initial pain scores (difference 2.0; 95%CI: 1.4 to 2.7) and had more often a traumatic cause of pain compared to those included in the pre- phase (difference 20%; 95%CI: 9% to 30%).
Participants reported that mostly paracetamol was recommended for pain relief (68% pre-, 89% post-). Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) were sometimes advised (4% pre-, 4% post-) or a combination of paracetamol and NSAIDs (9% pre-, 7% post-). Opioids were rarely prescribed (1% pre-, 0% post-).
The questionnaire was mostly completed online. Eight participants requested a questionnaire by mail, only one participant subsequently filled out the questionnaire.

Figure 1: Study flow chart

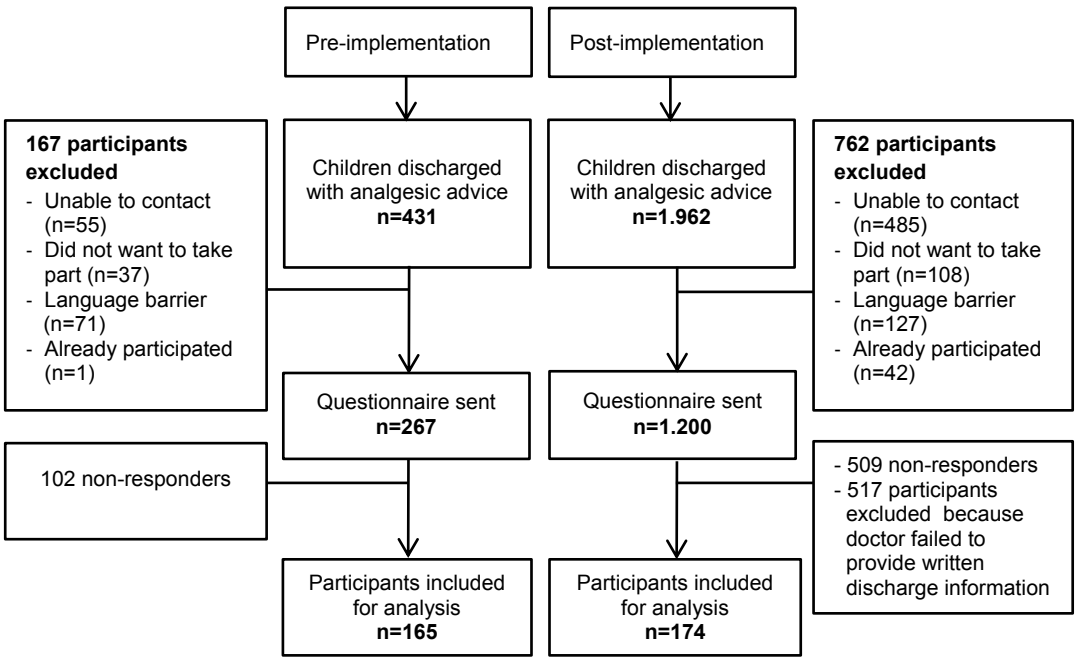

Table 1: Baseline characteristics of the study population

Baseline characteristics	Pre-implementation (n=165)	Post-implementation (n=174)	Difference* (95% CI)
Parents/carers (responding)			
Age [years mean (range)]	36.4 (20-53)	36.0 (21-54)	-0.4 (-1.8 to 1.0)
Gender [Male (%)]	38 (23)	17(10)	-13% (-30% to -17%)
Level of education[1]			
Low (%)	12 (8)	20 (12)	4% (-2% to 10%)
Middle (%)	69 (43)	74 (43)	0% (-10% to 11%)
High (%)	80 (50)	77 (45)	-5% (-15% to 6%)
Patients (children)			
Age [years mean (range)]	4.7 (0-12)	5.4 (0-12)	0.6 (-0.3 to 1.4)
Gender [Male (%)]	87 (53)	95 (55)	2% (-9% to 13%)
Family composition[2]			
Single parent family (%)	24 (15)	28 (16)	2% (-6% to 9%)
Two parent family (%)	139 (84)	143 (82)	-2% (-10% to 6%)
Other (%)	1 (1)	2 (1)	0% (-1% to 3%)
Pain score at entry[3] (SD)	2.07 (1.3)	4.1 (2.3)	2.0 (1.4 to 2.7)
Pain score at discharge[4] (SD)	2.71 (1.4)	2.2 (1.4)	-0.5 (-0.03 to -1,0)
Discharge diagnoses[5]			
Traumatic (%)	59 (36)	96 (56)	20% (9% to 30%)
Non-traumatic (%)	106 (64)	77 (45)	-20% (-30% to 9%)
Days between ED visit and filling out questionnaire (SD)	6.06 (4.5)	7.34 (5.6)	1.3 (0.2 to 2.4)

CI: Confidence Interval, SD: Standard Deviation
*Post-implementation minus pre-implementation
[1]Pre-implementation (n=161), Post-implementation (n=171)
[2]Pre-implementation (n=164), Post-implementation (n=173)
[3]Pre-implementation (n=121), Post-implementation (n=61)
[4]Pre-implementation (n=102), Post-implementation (n=44)
[5]Pre-implementation (n=165), Post-implementation (n=173)

Primary endpoint - Correct recall

Correct recall was significantly higher in participants the post-implementation phase compared to the pre-implementation phase (difference 29%; 95%CI: 19% to 39%). None of the baseline characteristics of the participants was a significant predictor of correct recall in the pre- or post- phase. A univariate analysis returned the age of the child seen in the ED as a significant predictor of correct recall in the pre- phase (OR 1.11; 95%CI: 1.01 to 1.2), but this did not remain significant under multivariate regression analysis.

Secondary endpoints

More participants in the post-implementation phase gave analgesics to their child compared to participants in the pre-implementation phase (difference 11%; 95%CI: 1% to 20%), this was true for both giving analgesics at set times or just when needed (PRN) (Table 2). There was no significant difference between the pre- and post-phases for the total number of days using analgesics (difference 0.08; 95%CI: -0.73 to 0.88) or in the perceived limitation of the children's daily activities due to pain

(difference -7%; 95 CI: -16% to 2%). In the pre- phase 19% of participants found the advice given at discharge unclear, in the post- phase this decreased to 2%.
Children of participants in the post-implementation phase were less like to re-attend healthcare services for the same complaint when compared to the pre-phase (difference -6%; 95%CI: -13% to 0%).

Table 2: Correct recall, analgesic use at home, re-attending healthcare services and participant satisfaction

Results	**Pre-implementation** (n=165)	**Post-implementation** (n=174)	**Difference*** (95% CI)
Correct recall (%)	56 (34)	109 (63)	29% (19% to 39%)
Analgesics given at home after ED visit (%)	110 (67)	135 (78)	11% (1% to 20%)
Number of days on analgesic (SD)	2.93 (2.5)	2.85 (3.4)	0.08 (-0.73 to 0.88)
When were analgesics given?			
Not (%)	43 (26)	20 (12)	-15% (-23% to -6%)
At set times (%)	70 (42)	81 (47)	4% (-6% to 15%)
When child reported pain (%)	30 (18)	52 (30)	12% (3% to 21%)
If high fever was measured (%)	2 (1)	4 (2)	1% (-2% to 4%)
Bedtime (%)	4 (2)	4 (2)	-1% (-3% to 3%)
Other (%)	3 (2)	11 (6)	- 7% (-11% to -2%)
Missing (%)	13 (8)	2 (1)	
Physical activity of child			
No or slight limitation (%)	122 (76)	144 (83)	7% (-2% to 16%)
Marked limitation to uncontrolled pain (%)	39 (24)	30 (17)	-7% (-16% to 2%)
Re-attended healthcare services (%)	22 (13)	12 (7)	-6% (-13% to 0%)
Participant satisfaction with discharge instructions[1]	46 (33)	50 (29)	-4% (-14% to 6%)
Highly satisfied (%)	41 (29)	80 (46)	17% (-7% to 30%)
Satisfied (%)	51 (18)	34 (20)	1% (-7% to 10%)
Neutral (%)	2 (1)	6 (3)	2% (-1% to 5%)
Unsatisfied (%)	0 (0)	4 (2)	2% (-0% to 5%)
Highly unsatisfied (%)			

CI: Confidence Interval, SD: Standard Deviation
[1]Pre-implementation (n=140), Post-implementation (n=172)
*Post-implementation minus pre-implementation

Three in four (75%) participants in the post-implementation phase were satisfied with their discharge instructions, this percentage was significantly higher compared to the pre-implementation phase (62%, difference -13%; 95%CI: -23% to -3%). The majority of participants (88%) found the written information in the leaflet clear.
The most popular way for delivering discharge instructions for participants in the post-implementation phase was verbal (93%) followed by written instruction (83%). One in four (25%) wanted telephone discharge instructions and 16% video discharge instructions.

Five percent of the participants in the post-implementation phased watched the online video. Only female parents watched the video, they were most likely to have a middle education level and had higher satisfaction scores about discharge instructions. The children of participants who watched the video had higher pain scores at discharge and more often a non-traumatic cause of pain (Supplementary Table 1).

Acceptability of the intervention

An opportunity sample of approximately half (n=40) of the participating physicians completed the OADRI questionnaire about acceptability of implementation of the leaflet. Overall, the physicians strongly agreed that the leaflet was easy to use, was useful in their daily practice and thought the content was clear and unambiguous. Moreover, physicians thought participants would benefit from receiving the leaflet (Supplementary Table 2).

However, physicians were unaware of the scientific evidence of the benefit of providing written discharge information. Importantly, in the free text of the questionnaire, physicians reported logistical barriers to giving the leaflet to participants at discharge (e.g. leaflets were not available in all consulting rooms).

DISCUSSION

Principal findings

This study showed that participants who received a leaflet with discharge instructions (including a link to an online information video) had a significantly higher correct recall of the correct use of analgesics for their children following an ED visit. Moreover, in the post-implementation phase the participants reported giving analgesics to their children more often than those in the pre- phase, re-attended healthcare services less often and were more satisfied with their discharge instructions.

Preferences in discharge material

Contrary to our expectations, the video discharge instructions were not widely viewed by our participants (5%). A recent meta-analysis of studies set in adult and paediatric ED populations showed that correct recall increased from 47% in patients who received verbal information, to 58% of patients who received written information and 67% of patients who received video information [83]. It had been our intention to replicate this finding in our study but instead our participants did not take up the opportunity to watch the information on video. Whilst discharge instructions on video were considered a preferential adjunct to verbal instructions by patients with a mild traumatic brain injury (MTBI)[84], in this current study the parents and carers of children seen in the ED rarely chose to watch the video discharge instructions and the video was the least popular option for discharge instructions (16% of participants would choose instructions on video).

Our participants recorded high levels of satisfaction with the discharge leaflet (75% satisfied or highly satisfied compared to 62% in the pre- phase) and found the leaflet clear and unambiguous. This could contribute to a lesser need to seek clarification of the discharge instructions using a video. In comparison to Hoek et al.[84] our participants were not the patient themselves and they were not impaired by a MTBI,

also offering an additional possible explanation for why further clarification of discharge information was not needed.
The low level of engagement with our discharge video could have been due to the fact that having a link in the leaflet to our video available online made the video poorly accessible to our participants. The video may be more useful in a different setting such as showing on a TV in the waiting room or letting parents/carers watch the video on a tablet before discharge.
Of the 5% of participants that did watch the discharge video, the majority were women who had a middle level of education. We are unable to speculate why the option of the video was more popular with this subgroup, further research would be needed.
Overall for our participants, verbal discharge instructions were the most popular choice (93%), possibly because parents and carers still value the explanation of the treating physician and the possibility to ask questions. This suggests a doctor cannot be replaced by video information.

Contribution to improving aftercare in the Paediatric ED
In the post-implementation phase of our study participants recorded more use of analgesics with their children compared to the pre- phase. This indicates that participants in the post- group adhered to the discharge instructions, providing appropriate aftercare to their children. It should be noted that in this group of children the cause of pain was more likely to be traumatic, but we are unable to ascertain from our data if this contributed to the greater use of analgesics. It would appear that the participants in the post- phase, after receiving the discharge leaflet, went on to provide optimised aftercare for their child. If written discharge instructions can empower parents and carers to confidently follow discharge instructions this is a worthy improvement over the pre- phase. Similar outcomes were found in paediatric patients with asthma. Compliance with follow-up outpatient clinic visits improved significantly when parents received more education about the severity of asthma in the ED, this difference was statistically significant after controlling for asthma scores [85].

In this study re-attendance to healthcare services following the initial ED visit was significantly lower in the post-implementation phase. A simple and relatively low-cost intervention such as a discharge leaflet about analgesic use could have a positive effect on improving aftercare for paediatric patients and also reducing the burden of preventable re-attendance to healthcare services. The participants in the post-implementation phase were more satisfied about their discharge instructions, demonstrating an improvement in the quality of care. We cannot provide good care if we leave out written discharge instructions.

Limitations
We are aware our study has some limitations. A pre- and post- implementation design does not allow for randomisation of participants or blinding to the intervention. This means we must exercise caution in attributing our intervention as the only cause of the increase in recall in the post- group. It is very possible the implementation of the leaflet led to increased awareness in physicians of how they delivered verbal discharge instructions. Verbal instructions in our study were not standardised. Participants in our pre- and post- groups were not homogenous, the marked

difference being the cause of the child's pain. This may have influenced our secondary endpoints, e.g. pain medication given at home.
Despite active promotion among physicians of the use the leaflet during the implementation phase, the percentage of participants that indicated that they received the leaflet was low (174 of 691 of participants). This may have caused selection bias, for example when patients reported more pain, treating physicians may have been more likely to provide the leaflet. From our data we cannot extract the reasons why treating physicians did not provide the leaflet. As a result we used the OADRI to evaluate the acceptability of the intervention. This showed that, although the leaflet was clear and unambiguous, logistical barriers, such as availability of leaflets in consulting rooms, were the main reason the leaflet was not provided at discharge.

Conclusion
In this two-centre study, introduction of written discharge instructions was associated with higher correct recall of information about analgesic use in children after an ED visit. This intervention warrants further study to assess external validity.

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SEH
Zorg na Spoedeisende Hulp

Part II

Evaluating video discharge instructions.

Chapter 5

Attitude of patients, healthcare professionals, and noninjured lay persons towards online video instructions on mild traumatic brain injury: a cross-sectional study.

Hoek AE, Hamer MVD, Deelstra CK, Beeck EFV, Dippel DWJ, Haagsma JA, Rood PPM.

Int J Emerg Med. 2017 Dec;10(1):25.

ABSTRACT

Background
The objective of this study was to determine the attitude of patients, healthcare professionals, and noninjured lay persons towards adding a video with discharge instructions to patient care for patients with mild traumatic brain injury (MTBI). A survey was conducted at the emergency department (ED). Participants consisted of MTBI patients (n = 50), healthcare professionals (n = 50), and noninjured lay persons (n = 50). The participants viewed a video with discharge instructions on MTBI and filled out a questionnaire that measured their attitude towards the use of a video as part of discharge instructions.

Findings
Nearly all healthcare professionals (94%) and 70% of the noninjured lay persons considered the video to be a valuable addition to oral discharge instructions. For 84% of patients, verbal information from the doctor is of importance. And, 50% of patients would like to receive additional video discharge instructions.

Conclusions
The majority of noninjured lay persons and healthcare professionals and half of the MTBI patients consider a video with discharge instructions to be a valuable addition to patient care. Video discharge instructions are a relative low-cost measure that could enhance patient care at the ED, provided that this does not compromise the personal contact between patient and healthcare professional.

INTRODUCTION

Mild traumatic brain injury (MTBI), or concussion, often leads to persistent symptoms. These symptoms, such as headaches, mild cognitive problems, and dizziness, may last for weeks or even months after the concussion.[1-3]

Evidence suggests that providing patients with discharge instructions containing adequate educational information on MTBI can help reduce or even prevent post-concussion symptoms, particularly early after the injury.[4] Patients remember discharge instructions better when they receive written instructions additional to oral information only.[5] However, a prerequisite for the effectiveness of written discharge instruction is a sufficient literacy level of the recipient. For some treatments in the emergency department (ED) video discharge instructions have shown to improve comprehension and recall of key points.[6,7] However, for patients with brain concussion, potentially suffering from headache and cognitive problems, this is unknown.

An important step in finding the most effective way of providing patient information on MTBI is to assess the feasibility and acceptability of an online video with discharge instructions.

The objective of this study was to determine the attitude of patients, healthcare professionals, and noninjured lay persons towards adding a video with discharge instructions to patient care for patients with MTBI.

METHODS

A survey study was conducted at the ED of a tertiary center in Rotterdam, the Netherlands, between November 2014 and July 2015. The aim was to include 50 MTBI patients, 50 healthcare professionals, and 50 noninjured lay persons. The study subjects consisted of a convenience sample of MTBI patients, healthcare professionals, and noninjured lay persons. The noninjured lay persons were recruited from a social network by contacting them personally or by email. Snowball sampling was used for the recruitment strategy, i.e., participants were asked to recruit future participants among their contacts. The selection criterion was that the noninjured lay persons were not engaged in any medical profession. The healthcare professionals consisted of nurses and doctors. Selection criteria for the healthcare professionals were that they had to be entrusted with the care for MTBI patients and were not involved in the study. Healthcare professionals were recruited during their shift at the ED or the neurology department. The selection criteria for MTBI patients were treatment at the ED, aged 18 years and older, a Glasgow Coma Scale (GCS; a neurological scale ranging from 3 to 15 that is based on eye, motor, and verbal responses of the patient) greater than 13 at first contact, and post-traumatic loss of consciousness of less than 30 min (indicated in the history of the patients). MTBI patients were excluded if they did not master the Dutch language, had an intracranial abnormality on the CT-scan, a focal neurological deficit, or if they were unable to give informed consent. Patients were recruited by one of the researchers according to a rotating schedule representing all shifts and days of the week.

Once participants decided to participate in the study, they were shown a video with discharge instructions for MTBI (https://drive.google.com/file/d/0B90I2el_JbUtVlh Wdk1TM3ltdkE/edit?usp=sharing). The information in this video is based on the national guideline for management of mild head injury which includes advisory information for patients. The discharge instructions shown in the video provided background information on MTBI, information about common symptoms, typical course of recovery, advice about how to manage or cope with symptoms, gradual reintegration to regular activities, and when to contact a medical expert. Healthcare professionals and noninjured lay persons either watched the video on a research computer (individually or in small groups) or at home through the online link. Hereafter the healthcare professionals and noninjured lay persons filled out the questionnaire individually, on paper, or digitally. Patients watched the video at the ED after their treatment was finished, before discharge from the ED when they had a GCS of 15. They filled out the questionnaire immediately after watching, at the ED. The questionnaire administered to the MTBI patients and noninjured lay persons which was developed in agreement with a psychologist and an emergency physician, consisted of questions on age, sex, and educational level (high education level: finished at least higher secondary education) and nine questions concerning the video and their attitude towards the applicability and value of the
use of adding the video with discharge instructions to patient care. The questionnaire administered to the healthcare professionals consisted of questions on age, sex, position, and 11 questions on the video and their attitude towards the applicability and value of the use of adding the video with discharge instructions to patient care. The questionnaire also included open ended questions which asked the participants to explain their answer. Ethical approval was obtained from the research ethics committee of the study center before the initiation of the study (MEC-2015-175). All MTBI patients gave written informed consent before inclusion.

Data was analyzed with descriptive statistics (frequencies and crosstabs with chi-square testing) in statistical package for social sciences (SPSS) 21.0.

FINDINGS

MTBI patients

During the study period 78 MTBI patients were seen at the ED, of which 58 met the inclusion criteria. Of these patients, 50 (86.2%) were willing to participate in the study. The median age of the MTBI patients was 46.5 years [range: 18–93] (Table 1). MTBI patients were mainly elderly women (age > 50 years) or young men (age ≤ 50 years). Verbal information from the doctor is deemed important by 84% of patients, of whom 74% (n = 31) would like to receive additional written, telephone, or video discharge instructions 68.0% (n = 34) stated that they would watch the video at home. Half of the patients (n = 25, 50%) indicated that they preferred the video to be part of their discharge instructions (Fig. 1). Age, sex, and educational level did not differ between patients who did or did not prefer video discharge instructions.

Table 1: Patient characteristics

Participant characteristics

	MTBI patients (n = 50)	Healthcare professionals (n = 50)	Noninjured lay persons (n = 50)
Male	27 (54%)	19 (38%)	26 (52%)
Age (median and range)	46.5 [18-93]	30.5 [23-61]	48 [21-87]
High level of education*	14 (28%)	-	18 (36%)

* high education level: finished at least higher secondary education

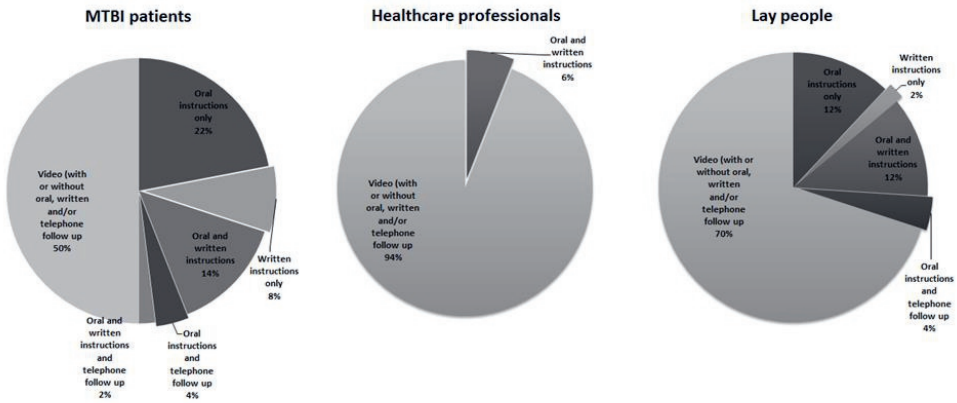
Healthcare professionals

Fifty healthcare professionals participated in the study. The median age was 30.5 years [range 23–61] (Table 1). 94.0% (n = 47) considered the video to be a valuable addition to their discharge instructions and all would advise patients to watch the video (Fig. 1). 46.0% (n = 23) was in favor of giving patients the link to the online video so they can watch the video at home. No statistically significant difference was found in preference for video discharge instructions for gender or age of the healthcare professionals.

Noninjured lay persons

Fifty noninjured lay persons were included with a median age of 48.0 years [range 21–87] (Table 1). Seventy percent (n = 35) considered the video to be a valuable part of discharge instructions (Fig. 1). No statistically significant difference was found in preference for video discharge instructions for gender or age. However, noninjured lay persons with a high educational level would like to receive video discharge instructions significantly more often than noninjured lay persons with a low educational level ($p < 0.05$).

Figure 1: Preferred mode of discharge instructions



DISCUSSION

This study showed that the majority of healthcare professionals and noninjured lay persons consider a video with discharge instructions to be a valuable addition to patient care.

Half of the of MTBI patients believed that a video could be a valuable part of their discharge instructions. Our study showed that 84% of the patients indicated that they wanted to receive oral discharge instructions, with or without additional alternative methods. We speculate that the main reason for not wanting a video may be that they place high value on personal contact with medical professionals.

Remarkable is that compared to other studies, we found less patients would be content with the video as part of their discharge instructions.[8] An important difference with these studies was that the patients could watch the video at home. An online video would give patients (and their significant others) the opportunity to watch discharge instructions at a time when symptoms have reduced. Moreover, they can watch the video multiple times and in a less stressful environment than the ED, increasing comprehension and recall of key discharge instructions. Also, these studies did not study specifically MTBI patients. The sustained brain injury may influence the willingness and capability to watch a video.

A necessary condition for offering online video with diagnosis-specific discharge instructions is internet access among the target group. In the Netherlands, 97% of the inhabitants have internet access.[9]

Important to note is that the video used in this study showed a doctor explaining MTBI and the consequences and some parts included written text, but the video did not contain animations. This may have affected our results. A recent study concluded that spoken animations may be the best way to explain complex health information to people with low health literacy.[10] Hence, the proportion of people who would like

to watch a video as part of their discharge instructions may be higher if the video includes animations. More research is needed to investigate
the effectiveness of video discharge instructions with animations, both in patients with MBTI and other diseases and syndromes.

Conclusions
The majority of noninjured lay persons and healthcare professionals, and half of the MTBI patients consider a video with discharge instructions to be a valuable addition to patient care. Video discharge instructions are a relative low-cost measure that could enhance patient care at the ED, provided that this does not compromise the personal contact between patient and healthcare professional.

Clinical implications
From a professional perspective, video discharge instructions could enhance patient care at the ED, but this should be embedded in counseling approaches tailored to different preferences of patients.

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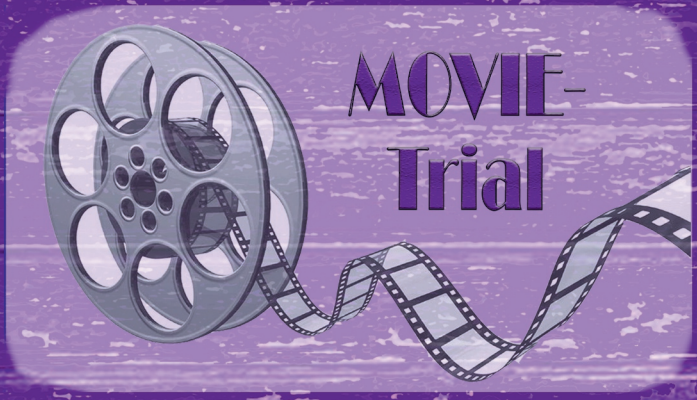
MOVIE-
Trial

Chapter 6

Effect of video discharge instructions for mild traumatic brain injury patients in the emergency department: A randomized controlled trial.

Mild traumatic brain injury and Outcomes from VIsual patient Education (MOVIE-trial).

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ABSTRACT

Study objective
To measure the effect of video discharge instructions on post-concussion symptoms, in patients with Mild Traumatic Brain Injury (MTBI) in the Emergency Department.

Methods
A multicenter randomized controlled trial was conducted in which MTBI patients were randomly assigned to either intervention (verbal, written and video discharge information) or control (verbal and written discharge information only). All patients were interviewed one week and three months from randomization. Primary outcome measure was the Rivermead Post-Concussion Questionnaire (RPQ) at 3 months. Secondary outcomes were correct recall, hospital anxiety and depression scale (HADS), health-related quality of life (SF-12), return visits and patient satisfaction.

Results
2883 patients were assessed for eligibility of whom 381 patients were included in the control group and 390 patients in the video intervention group. Difference in mean total RPQ score between the two groups was 0.2 at 1 week and 0.3 at 3 months post-TBI (estimated effect -0.7; 95% confidence interval: -2.1 to 0.7). There was also no difference in HADS score, recall, SF-12, return visits and patient satisfaction between the control and intervention group.

Conclusion
Severity of post-concussion symptoms in patients with MTBI did not improve by adding video information to standard care. Also, there was no difference in recall, health-related quality of life, return visits and patient satisfaction between the control and intervention group.

INTRODUCTION

Background

Mild traumatic brain injury (MTBI) is a common diagnosis in the Emergency Department (ED). In high income countries, 100-300 per 100,000 patients with MTBI are seen in the ED.[1] This condition poses a serious health problem in terms of days lost because of illness. In the first weeks after MTBI, many patients suffer from post-concussion symptoms, such as headache, dizziness, attention difficulties, fatigue, memory problems and anxiety, which can result in functional health loss and can also prohibit returning to work after injury. The symptoms usually disappear spontaneously within 3 months.[2] The reported occurrence of persistent symptoms 3 months after MTBI varies between 35% and 86%.2-9

Importance

A number of studies provide evidence that increased knowledge and understanding of post-traumatic symptoms through educating and reassuring patients can be effective in preventing or reducing post-concussion symptoms.[7, 8, 10-12] Furthermore, patients who believe that their symptoms will have serious negative consequences are more likely to develop long-term post-traumatic symptoms.6 Thus, knowledge and understanding of post-traumatic symptoms and complications may decrease the severity and/or likelihood of developing post-concussion symptoms. There are several ways to provide discharge information to patients in the ED, most often information is given verbally or in written form.[13] Nonetheless, even though patients are provided with written information, there can still be knowledge deficits.[14] Adding audio-visual information has been shown effective in providing information and increasing patient knowledge.[15-17] Also, healthcare professionals caring for MTBI patients and MTBI patients consider a video with discharge instructions to be a valuable addition to patient care.[18] However, the effect of video discharge information for MTBI patients on post-concussion symptoms still needs to be established.[10]

Goals of this investigation

The main objective of this randomized controlled trial (RCT) was to test whether video discharge instructions in the ED reduced post-concussion symptoms after 3 months in MTBI patients.

Our secondary objectives were to test if the intervention improved recall of discharge instructions, decreased anxiety and depression symptoms, improved health-related quality of life, decreased the number of return visits and improved patient satisfaction.

MATERIALS AND METHODS

Study Design and Setting

An RCT was conducted in the ED of 6 hospitals in the Netherlands between October 2016 and October 2018.[19] The participating hospitals consisted of one inner-city tertiary hospital, four urban hospitals, and one rural hospital. (see Figure 1 for an overview of the hospitals and inclusion periods per hospital).

Figure 1: Overview of the hospitals and inclusion periods per hospital.

EMC: Erasmus Medical Center, Rotterdam, The Netherlands.
HMC: Haaglanden Medical Center, The Hague, The Netherlands.
FG: Franciscus Gasthuis, Rotterdam, The Netherlands.
RdG: Reinier de Graaf, Delft, The Netherlands.
DZ: Dijklanderziekenhuis, Hoorn, The Netherlands.
ADRZ: Admiraal de Ruyter Hospital, Goes, The Netherlands.

Selection of Participants in the RCT

We included a convenience sample of adult patients with MTBI presenting to the ED of the participating centers between October 1, 2016 and October 31, 2018. MTBI was defined as blunt trauma to the head with visible injury and a Glasgow Coma Scale score at first examination of 14 or 15, post-traumatic loss of consciousness less than 30 minutes, and post-traumatic amnesia not exceeding 24 hours.[20] Patients were excluded if they had intracranial abnormalities on Computerized Tomography (CT) scan, a focal neurological deficit, insufficient command of the Dutch language and if informed consent could not be obtained.

Study procedure

Patients were asked to participate in the study shortly before they were discharged from the ED at all sites. After informed consent was obtained and patients were included, patients were randomly assigned to one of the two groups. The randomization was computerized and performed by block randomization (blocks of 8 patients) on gender and age (<49 year and ≥ 50 year). The control group received verbal and written discharge instructions on MTBI. In addition to verbal and written discharge instructions, the intervention group watched a video with discharge information on MTBI in the ED, under supervision of a health care professional. Patients also received a link to the website, in order to watch the video again at home. All patients were followed up by a standardized telephone interview at 1 week (attempts up to 21 days after ED visit) and 3 months (attempts up to 18 weeks after ED visit) after discharge from the ED. Trained interviewers were blinded for the intervention allocation.

We estimated a priori that 384 subjects per group would be sufficient to detect a significant (alpha=0.05) effect (30% difference in mean score of the RPQ) of the intervention with a power of 80% assuming a mean occurrence of post-concussion symptoms of 40% in the control group.

Video development
The duration of the video is approximately 4 minutes, (http://www.sehzorg.nl/hersenschudding) and the content based on the Dutch National Guidelines for MTBI.[20] In this video an emergency physician provides discharge instructions according to the current guidelines that include information on post-concussion symptoms and how to deal with these symptoms. Also animations were used aiming to improve understanding of the information and recall.[15] The video was developed in cooperation with patient educators of the Dutch Brain Foundation, and a production company experienced in patient education. The video was reviewed by emergency physicians, a neurologist and patient representatives.

Ethics
Ethical approval was obtained from the ethics and research board of the Erasmus MC University Medical Center Rotterdam before start of the study. All patients gave written informed consent before participating in the study. This study was funded by the Dutch Brain Foundation for the production of the video and by the Netherlands Emergency Medicine Research Fund. The study was registered in the Netherlands Trial Registration (NTR5465).

Outcome Measures
The primary outcome was the occurrence and severity of post-concussion symptoms measured by the Rivermead Post-Concussion Questionnaire (RPQ) at 1 week and 3 months after randomisation.[21, 22] The RPQ consists of 16 items that pertain to post-concussion symptoms, including headaches, dizziness, nausea/vomiting, noise sensitivity, sleep disturbance, fatigue, being irritable, feeling depressed or tearful, feeling frustrated or impatient, forgetfulness, poor concentration, taking longer to think, blurred vision, light sensitivity, double vision, and restlessness. The respondents were asked to indicate the severity of the symptoms over the last 24 hours on a 5-point Likert scale: 0 (not experienced at all), 1 (no more of a problem), 2 (a mild problem), 3 (a moderate problem) and 4 (a severe problem). The total RPQ sum score varies between 0 and 64. RPQ-16 scores of 0 to 12, 13 to 24, 25 to 32, and 33 or more are considered as minimal, mild, moderate, and severe PCS, respectively.[23] There is no golden standard concerning the use of the RPQ to diagnose patients with post-concussion syndrome.[24] In this study, we a priori assumed a 5 points difference of RPQ as the minimal important difference (MID).2[5] We used the total RPQ score as indication of the severity of post-concussion symptoms.

Secondary outcome measures were recall of discharge instructions, anxiety and depression symptoms, health-related quality of life, return visits, and patient satisfaction. Recall of discharge instructions was measured by 3 questions on MTBI in three domains of patient education (diagnosis, therapy, and return instructions) (appendix 1).[16, 17] Correct recall was defined as a correct answer to these questions, i.e., the answer matched the information in the leaflet or in the video.
Anxiety and depression symptoms were measured with the Hospital Anxiety and Depression Scale (HADS) questionnaire.[26] The HADS consists of two subscales (depression and anxiety) with both 7 items on a 4-points Likert scale. The total HADS score is calculated by summing the score of each item and ranges from 0 to 42. We used the total HADS score as indication of the severity of anxiety/depression

symptoms.[27] We assumed a priori a MID of 1.6 points.[28] The HADS has been found valid in somatic, psychiatric and primary care patients and in the general population.[26]

Health-related quality of life was measured by the validated Dutch translation of the Short Form-12 Health Survey (SF-12).[27, 29-31] The SF-12 is a questionnaire that consists of twelve items and measures eight different domains of health (physical functioning, social functioning, role physical, role emotional, bodily pain, general health perception, energy/fatigue and mental health). For each domain, a summation of item responses is transformed into a score ranging from 0-100. The SF-12 is subsequently summarized in a Mental Component Summary (MCS) and Physical Component Summary (PCS) score. Higher PCS and MCS scores indicate better health.[32] The SF-12 has been found valid in TBI patients.[30] For this study we assumed an MID of 6.8 for the SF-12 a priori.[33]

Return visits were measured by asking patients how many times they visited the ED, general practitioner, outpatient clinic, or other therapist (e.g. physiotherapist) due to MTBI during the telephone interviews at 1 week and 3 months post ED visit. Patient satisfaction was measured at one week after ED visit on a 5-point scale: 0 (highly dissatisfied), 1 (dissatisfied), 2 (neutral), 3 (satisfied), 4 (highly satisfied).[16] The level of reassurance on the severity of the concussion by the discharge instructions was also measured on a 5-point scale: 0 (not at all), 1 (not completely), 2 (no opinion), 3 (partly), 4 (completely).

The 1-week follow up questionnaire included items on presence of comorbidity, education (categorized in low, medium or high), and family structure (living alone or with family). Comorbidity was determined per patient as the number of pre-existing conditions as indicated by the patient. Furthermore, the 3-month follow-up questionnaire included an item on legal procedures (as a result of trauma, if yes ongoing or finished). The severity of the injuries was recorded with the Injury Severity Score (ISS), that was based on information from the patient medical record.[34] Other patient characteristics (age and gender) were collected from patient records.

Data Analysis

We tested for differences in socio-demographic characteristics of respondents of the control and intervention group using a chi-squared test for categorical variables, Mann-Whitney U test and independent sample T-test for continuous variables.

Linear mixed-model analysis for repeated measurements were used to assess associations between the intervention and the patients' total RPQ, PCS, MCS and HADS score. In the mixed-model analyses, the intervention was included as a fixed factor. Covariates that were associated with total RPQ score in the univariate analysis were included in the models as fixed factors to be adjusted for.

Explanatory data analysis was used to determine correlations among the fixed factors to assess multi-collinearity. Restricted maximum likelihood (REML) was used to fit of the models.

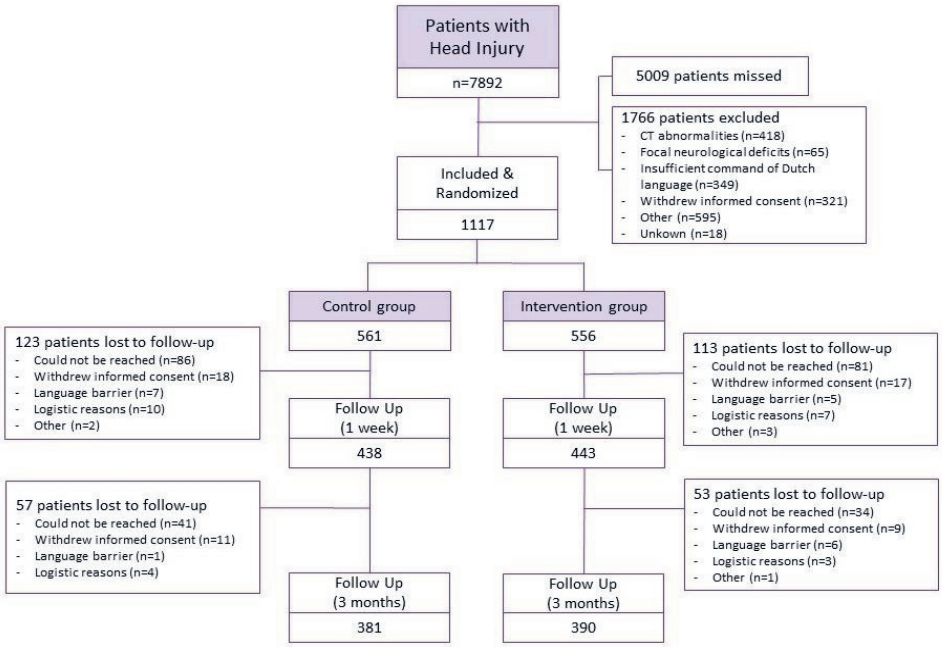
We tested for differences in patient satisfaction, level of reassurance tested using a chi-squared test and for differences in number of return visits using the Mann-Whitney U test.

The level of significance was taken as $p \leq 0.05$. Data was analyzed using IBM SPSS Statistical software (version 25).

RESULTS

During the study period 7892 patients with head injury were registered at the participating EDs. Of these patients, 2883 were assessed for eligibility, of whom 1766 were excluded. Main reasons for exclusion were abnormalities seen on Computerized Tomography (CT) scan (n=418), insufficient command of the Dutch language (n=349) and refusal of informed consent (n=321). The remaining 1117 patients were included and randomized. After randomization, 346 patients were lost to follow-up, mainly because they could not be reached by telephone within the time span of the study. Finally, a total of 771 patients were included (response 78% at one week and 69% at three months), 381 patients in the control and 390 patients in the video intervention group. (Figure 2). See Figure 1 for an overview of detailed information for each inclusion site.

Figure 2: Flowchart study



CT: Computerized Tomography
Control group: verbal and written discharge information
Intervention group: verbal, written and video discharge information

Characteristics of study subjects

Comparison of the characteristics of the missed patients versus the patients who were included in the study showed that the mean (SD) age of patients who were included was lower (59.7 (23.0) versus 52.5 (19.8)).

Patient characteristics are shown in Table 1. There was no difference in age, gender, ISS, co-morbidity, family structure, education level or legal procedures between the intervention and control groups.

Table 1: Patient characteristics control and intervention group

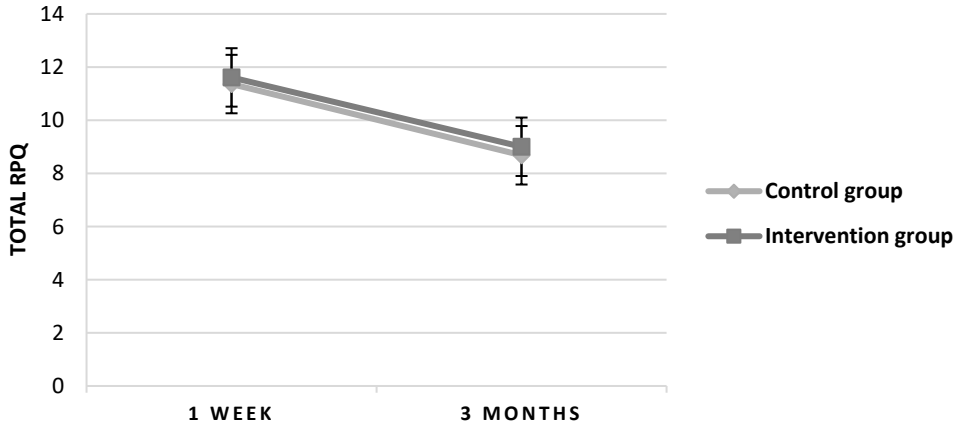
	Control (N = 381)	**Intervention (N = 390)**	**Difference* (95% CI)**
Gender, male No. (%)	201 (52.8)	205 (52.6)	-0.2% (-7.3% to 6.8%)
Age (SD)	51.1 (19.6)	53.7 (19.9)	-2.6 (-5.4 to 0.2)
ISS-score (SD)	2.5 (2.5)	2.5 (2.2)	0.1 (-0.3 to 0.4)
Comorbidity No. (%)	177 (46.5)	169 (43.3)	-3.2% (-10.2% to 3.8%)
Family structure			
Single household, No. (%)	108 (28.3)	124 (31.8)	3.5% (-3.0% to 10.0%)
Education level[a]			
Low, No. (%)	57 (15.0)	65 (16.7)	1.7% (-3.5% to 6.9%)
Medium, No. (%)	136 (35.8)	134 (34.4)	-1.4% (-8.1% to 5.3%)
High, No. (%)	187 (49.2)	190 (48.8)	-0.4% (-7.5% to 6.7%)
Legal procedure[b]			
At the moment, No. (%)	51 (14.1)	45 (12.1)	-2% (-6.8% to 2.8%)
Completed, No. (%)	10 (2.8)	9 (2.4)	-0.4% (-2.6% to 1.8%)
None, No. (%)	301 (83.1)	317 (85.4)	2.3% (-2.8% to 7.4%)

ISS: Injury Severity Score
Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions
*Intervention group minus control group
a) written = 1 missing; written + video = 1 missing
b) written = 19 missing; written + video = 19 missing

Main results

Primary outcome – There was no difference in total RPQ score between the control and the intervention group (Figure 3). Patients in the control group had a mean total RPQ score of 11.4 (95% confidence interval [CI] 10.3 to 12.4) at one week and 8.7 (95% CI 7.6 to 9.8) at three months, whereas in the video intervention group patients had a mean total RPQ score of 11.6 (95% CI 10.4 to 12.8) and 9.0 (95% CI 7.9 to 10.2) at one week and three months respectively.
Linear mixed model analysis detected associations between total RPQ-score and gender, age, educational level and pre-existing chronic disease (Table 2).

Figure 3: Total RPQ-score at 1 week and 3 months follow up of patients with mild traumatic brain injury, control and intervention group*



Total RPQ with 95% Confidence Interval
RPQ: Rivermead Post-Concussion Questionnaire
*1 week: control group = 3 missing; intervention group = 4 missing
*3 months: control group = 8 missing; intervention group = 6 missing
Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions

Table 2: Outcome measures of the control group versus the video intervention group. The estimated effect is the difference between the control and intervention group, adjusted for baseline characteristics.

	Control group			**Intervention group**			**Estimated effect[b] between groups (95% CI)**
	1 week	3 months	Δ[a]	1 week	3 months	Δ[a]	
Total RPQ score	11.4	8.7	2.5	11.6	9.0	2.6	-0.7 (-2.1 to 0.7)
Total PCS score	39.1	41.1	2.0	38.6	40.9	2.3	0.4 (-0.4 to 1.2)
Total MCS score	36.2	35.0	6.1	36.2	34.8	1.4	0.1 (-0.7 to 1.0)
Total HADS score	7.0	6.2	0.8	6.5	5.4	1.1	0.4 (-0.6 to 1.3)

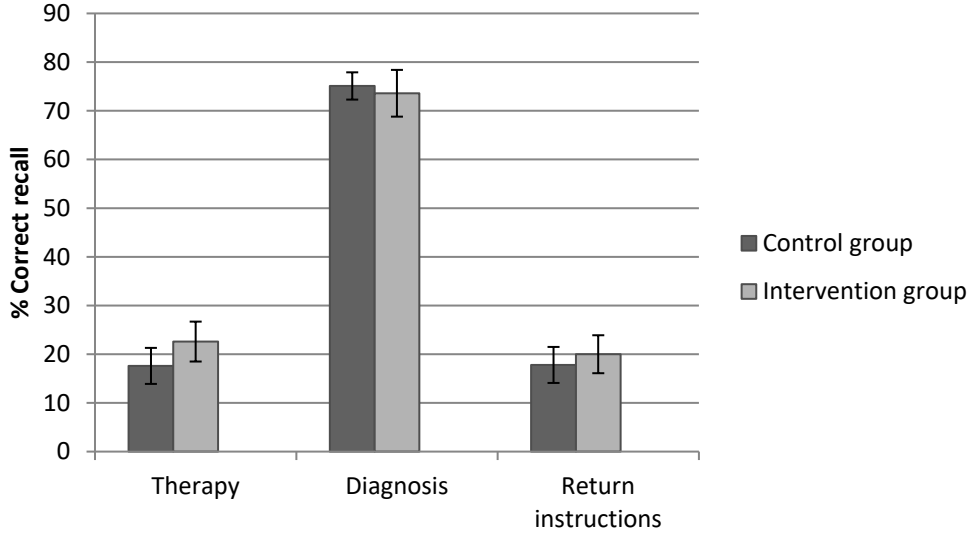
Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions
RPQ: Rivermead Post-Concussion Questionnaire
PCS: Physical Component Summary
MCS: Mental Component Summary (MCS)
HADS: Hospital Anxiety and Depression Scale
a) unadjusted difference
b) difference calculated with mixed effect model and adjusted for age, gender, educational level and comorbidity

Secondary outcomes

Anxiety/depression symptoms - Patients in the control group had a mean total HADS score of 7.0 (95%CI 6.2 to 7.8) at one week and 6.2 (95%CI 5.4 to 7.0) at three months, whereas in the intervention (additional video) group patients had a mean total HADS score of 6.5 (95%CI 5.8 to 7.3) and 5.4 (95%CI 4.7 to 6.1) at one week and three months respectively. The total HADS scores were slightly lower in the intervention group (Table 2). Health-related quality of life did not differ between the intervention and control group at one week (control: mean MCS 36.2 (95%CI 35.4 to 37.0) and mean PCS 39.1 (95%CI 38.3 to 39.9) vs. intervention: mean MCS 36.2 (95%CI 35.5 to 37.0) and mean PCS 38.6 (95%CI 37.9 to 39.3) or at three months (control: mean MCS 35.0 (95%CI 34.2 to 35.9) and mean PCS 41.1 (95%CI 40.4 to 41.7) vs. intervention: mean MCS 34.8 (95%CI 34.0 to 35.6) and mean PCS 40.9 (95%CI 40.2 to 41.5) (Table 2).

There was no difference in correct recall (Figure 4), return visits, visiting the general practitioner, visiting other therapist or level of reassurance caused by the discharge instructions between the two groups (Table 3). In the control group 41.5% of patients were highly satisfied or satisfied about their discharge instructions; in the intervention group 46.5% of patient were highly satisfied or satisfied about the manner of instructions.

Figure 4: Correct recall of the three domains of patient information in control group and intervention group



% correct recall with 95% Confidence Interval
Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions

Table 3: Secondary outcome measures, by type of discharge instructions

Outcome:	Control group (N=381)		Intervention group (N=390)		Difference* (95% CI)	
	1 week	3 months	1 week	3 months	1 week	3 months
Satisfaction about instructions						
Highly dissatisfied, No. (%)	4 (1.0)		5 (1.3)		0.3% (-1.2% to 1.8%)	
Dissatisfied, No. (%)	23 (6.0)		18 (4.6)		-1.4% (-4.6% to 1.8%)	
Neutral, No. (%)	19 (5.0)		17 (4.4)		-0.6% (-3.6% to 2.4%)	
Satisfied, No. (%)	177 (46.5)		170 (43.6)		-2.9% (-9.9% to 4.1%)	
Highly satisfied, No. (%)	118 (31.0)		139 (35.6)		4.6% (-2.0% to 11.2%)	
Unknown, No. (%)	40 (10.5)		41 (10.5)		0.0% (-1.3% to 4.3%)	
Satisfaction about manner of instructions[b]						
Highly dissatisfied, No. (%)	4 (1.0)		1 (0.3)		-0.7% (-1.8% to 0.4%)	
Dissatisfied	15 (3.9)		10 (2.6)		-1.3% (-3.8% to 1.2%)	
Neutral	11 (2.9)		11 (2.8)		-0.1% (-2.4% to 2.2%)	
Satisfied	188 (49.3)		185 (47.4)		-1.9% (9.0% to 5.2%)	
Highly satisfied	114 (29.9)		142 (36.4)		6.5% (-0.1% to 13.1%)	
Unknown	48 (12.6)		41 (10.5)		-2.1% (6.6% to 2.4%)	
Level of reassurance						
Complete, No. (%)	235 (61.7)		235 (60.3)		-1.4% (-8.3% to 5.5%)	
Partly, No. (%)	65 (17.1)		78 (20.0)		2.9% (-2.6% to 8.4%)	
No opinion, No. (%)	24 (6.3)		14 (3.6)		-2.7% (-5.8% to 0.4%)	
Not completely, No. (%)	21 (5.5)		24 (6.2)		0.7% (-2.6% to 4.0%)	
Not at all, No. (%)	3 (0.8)		7 (1.8)		0.1% (-0.6% to 2.6%)	
Unknown, No. (%)	33 (8.7)		32 (8.2)		-0.5% (-4.4% to 3.4%)	
Visit general practitioner						
No. (%)[c]	56 (14.7)	71 (18.7)	57 (14.6)	64 (16.4)	-0.1% (-5.1% to 4.9%)	-2.3% (-7.7% to 3.1%)
ED visit No. (%)[d]	3 (0.8)	3 (0.8)	5 (1.3)	7 (1.8)	0.5% (-0.9% to 1.9%)	-1.0% (-0.6% to 2.6%)
Visit other therapist, No. (%)[e]	16 (4.2)	37 (9.7)	10 (2.6)	38 (9.7)	-1.6% (-4.2% to 1.0%)	0.0% (-4.2% to 4.2%)

Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions
*Intervention group minus control group
a) at one week: control group = 2 missing, at three months control group = 1 missing
b) control group = 1 missing
c) at three months: control group = 1 missing
d) at one week: control group = 1 missing; intervention group = 2 missing; at 3 months: control group = 1 missing; intervention group = 1 missing
e) at one week: control group = 1 missing. At three months: control group = 4 missing; intervention group = 6 missing

Strengths and limitations

As far as we know, this is the first large, multicenter, randomized controlled trial that specifically investigated the effects video discharge instructions on the occurrence and severity of post-concussion symptoms in patients with MTBI.
Aside from the size of the study population and large range of outcome measures, a major strength of the study is the compliance with the intervention. As part of the intervention, the video was shown in the ED, therefore every patient in the intervention group watched the video at least once.

However, this study also has some limitations. First, this was not a consecutive sample; only one in four patients with head trauma were asked to participate in the study by the treating physician. This may have introduced selection bias. Consequently, the study sample may not be representative for the actual MTBI patients seen at the ED. However, comparison of the characteristics of the missed patients versus the patients who were included in the study showed no difference between these groups with respect to gender and ISS. Therefore, we assume that if selection bias occurred, the effect on the results of the study is small if any.
Second, loss-to-follow up occurred (follow-up rate of 68% at three months), this might have caused either overreporting of symptoms (patients who were lost had less or no complaints and therefore would not answer the telephone anymore) or underreporting of symptoms (complaints of patients who were lost were too heavy to answer the telephone). However, the follow-up rate at one week (78%) is comparable to other studies that investigated patient education by video.[16, 17] Third, the follow-up rate at three months is higher than [35] or only slightly lower [36] compared to other studies on post-concussion symptoms for MTBI patients. Fourth, the multivariable model used in the analysis was exploratory in nature, which may have resulted in an incorrect interpretation of the results of the analysis. Fifth, in our analysis we did not address the issue of within-center correlations with a cluster analysis. Reason for this was that the number of included patients for some of the centers was very small.
Furthermore, it should be noted that data of a historical control group was part of the original registered design of the study. However, this was excluded in this paper for clarity.

DISCUSSION

This study investigated the effect of video discharge instructions on the occurrence and severity of post-concussion symptoms in patients with MTBI in the ED. Contrary to what we expected, we found no difference in RPQ score between patients with MTBI who received additional video information and patients who received written and verbal information only.

Our study contradicts previous studies in which is shown that more patient education results in a reduction of post-concussion symptoms. Ponsfort et al investigated 202 MTBI patients and reported that the patients who received written information reported fewer symptoms overall at one-week and three months post-injury. And they were significantly less stressed at 3 months post-injury compared to patients

who received standard ED treatment (without written information and outpatient clinic visit) only.[11] However, in this study extended patient education (including outpatient clinic visit) was investigated, which might have resulted in more effect on symptoms.
An RCT investigating the effect of self-care supported SMS in 42 patients with MTBI found fewer and less severe post-concussion symptoms in patients who daily received those SMS compared to patients who received standard ED treatment only (including a patient instruction handout) although these differences were not significant.[7] This study had a much smaller sample size than our study and the intervention was more extensive which might explain the effect. Further research is necessary to show if more extensive patient education by video, e.g. watching the video at home again, can demonstrate a positive effect on post-concussion symptoms.

There are however other studies that investigated the effect of type of discharge information on patient outcome and found like our present study, no improvement or even worsening of complaints after extended patient information. Alves et al. concluded that there was no difference among the three treatment groups (routine treatment, information only, and information and reassurance) in post-concussion symptoms at three months.[37] Hanks et al. found significantly more post-concussion symptoms in patients who received extended written information compared to patients who received short written information.[38] These studies included less patients, the interventions varied substantially, and the type of follow up also varied widely. It seems that more information does not directly lead to less post-concussion symptoms. Patients may even report more symptoms when they are better educated. This was for instance also seen in patients with type one diabetes.[39]

Important to mention is that there are differences in measuring post-concussion syndrome and how these symptoms were classified. As mentioned before, our study found contradictive results compared to some previous studies. Part of the differences can be explained because the interpretation of the RPQ score is not clear-cut and multiple models for interpreting RPQ have been described in the literature.[23, 24, 40, 41] The prevalence of post-concussion syndrome ranged from 11.4% to 38.7%, depending on the classification methods used (the mapped International Classification of Disease 10th revision, Diagnostic and Statistical Manual of Mental Disorders 4th edition, RPQ total score, the RPQ 3 and the three factor model using different cutoff points).[24] In this study we used the total RPQ to measure post-concussion syndrome. Therefore, comparison to other studies may be difficult. However, we believe in our study the RPQ score is suitable because we use the same classifications in both groups at both measure points.

Regarding anxiety and depression, we found no difference in HADS scores in patients who watched the video compared to patients who had not. This validated questionnaire measures symptoms of anxiety and depression.[26] Although this was asked by single, non-validated, questions, there was no difference of reassurance between both groups. However, as for all our secondary outcomes, our study was not powered for the secondary outcome measures.
A recent systematic review and meta-analyses on discharge instructions and recall showed recall numbers of 47% in patients who received verbal discharge

instructions, 58% in patients who received also written discharge instructions, and 67% in patients who received additional video discharge instructions.[13] Though, we found no difference in correct recall between the control group and the video intervention group, the overall number of recall was lower than in this review. This could possibly be explained by the patient population of this study, i.e. patients with MTBI could suffer from memory deficits.[2]

Another recent review showed that written (computer generated) discharge instructions improved the extent and speed of provider communication which resulted in increased satisfaction for patients. Furthermore, several studies reported the use of video as part of discharge instructions improved patient satisfaction.[42] Although we also found an increase in patient satisfaction after implementation of a video with patient information, this was not significant in this study.

Our study does not show a significant change in post-concussion symptoms between patients who watched the information video and those who did not. Possibly, the use of video as part of discharge instructions is less suitable for specific patient populations, such as MTBI patients in the ED. However, there was no worsening of symptoms either. Therefore, video discharge instructions could still be a part of discharge instructions, depending on the patient's preference for instance. Furthermore, patients who watched the video are more satisfied about the way they were educated, and they reported less anxiety and depression symptoms after watching the video. Although these results are not significant, the study was not powered to detect significance for these secondary outcome measures. Future studies could answer those remaining questions.

In conclusion, severity of post-concussion symptoms in patients with MTBI did not improve by providing video discharge information. Also, there was no difference in recall, health-related quality of life, return visits and patient satisfaction between the control and intervention group.

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APPENDIX 1

Questions on recall of discharge instructions

Domain of discharge instructions	Question*
Therapy	When are you allowed to resume activities?
Diagnosis	Name two symptoms of concussion.
Return instructions	Name two reasons to return to the emergency department.

*The answers to the questions were ad verbatim in the written information and the video.

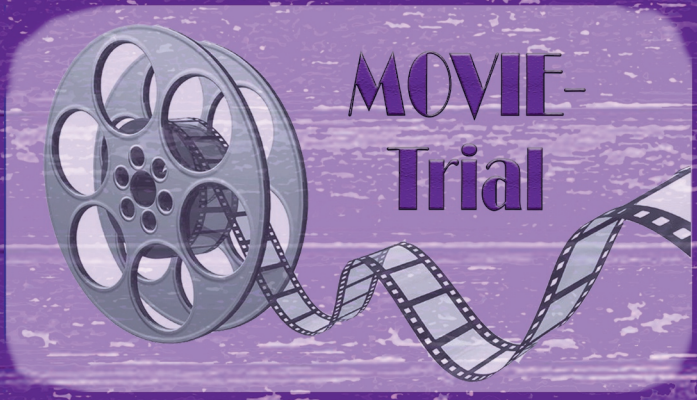
APPENDIX 2

Overview of detailed information for each inclusion site

Table 1: included patients for each center

Inclusion Center	**Control group (N = 381)**	**Intervention group (N = 390)**	**Difference* (95% CI)**
EMC (%)	206 (54.1)	206 (52.8)	-1.3% (-8.3% to 5.7%)
FG (%)	68 (17.8)	65 (16.7)	-1.1% (-6.4% to 4.2%)
WFG (%)	41 (10.8)	43 (11.0)	0.2% (-4.2% to 4.6%)
HMC (%)	21 (5.5)	21 (5.4)	-0.1% (-3.3% to 3.1%)
RdGG (%)	41 (10.8)	53 (13.6)	2.8% (-1.8% to 7.4%)
ADRZ (%)	4 (1.0)	2 (0.5)	-0.5% (-1.7% to 0.7%)

Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions
EMC: Erasmus Medical Center, Rotterdam, The Netherlands.
HMC: Haaglanden Medical Center, The Hague, The Netherlands.
FG: Franciscus Gasthuis, Rotterdam, The Netherlands.
RdG: Reinier de Graaf, Delft, The Netherlands.
DZ: Dijklanderziekenhuis, Hoorn, The Netherlands.
ADRZ: Admiraal de Ruyter Hospital, Goes, The Netherlands.
*Intervention group minus control group


MOVIE-
Trial

Chapter 7

The effect of written and video discharge instructions after mild traumatic brain injury on health care costs and productivity costs.

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ABSTRACT

Objective
To compare healthcare and productivity costs of patients with mild traumatic brain injury(mTBI) who received verbal discharge instructions only and patients who received an additional flyer with or without video instructions.

Setting
Emergency Departments (ED) of 6 hospitals in The Netherlands.

Participants
In total 1155 adult patients with mTBI (384 with verbal instructions; 771 with additional flyer with or without video instructions) were included.

Design
Cost study with comparison between usual care and intervention.

Methods
Medical- and productivity costs up to three months after presentation at the ED were compared between mTBI patients with usual care, and mTBI patients that received the intervention.

Results
Mean medical costs per mTBI patient were slightly higher for the verbal instructions only cohort (€337 vs. €315), whereas mean productivity costs were significantly higher for the flyer/video cohort (€1625 vs. €899). Higher productivity costs were associated with higher working age, injury severity and post-concussion symptoms.

Conclusion
This study showed that the implementation of flyer (and video) discharge instructions for patients with mTBI who present at the ED reduced medical costs, whereas productivity costs were found to be higher for the working population in the first three months after the sustained head injury.

INTRODUCTION

Mild traumatic brain injury (mTBI) is a common diagnosis in the Emergency Department (ED), with approximately 9% of all ED visits involving traumatic brain injury, of which 70-90% concerns mTBI.[1,2] In high income countries, 100-300 per 100,000 inhabitants with mTBI are seen in the ED.3 The reported occurrence of persistent post-concussion symptoms (PCS), such as headache, dizziness and attention difficulties, 3 months after mTBI varies between 35-86%.[4-11] Persistent symptoms may result in functional health loss and can also delay return to work (RTW) or study after injury.[12,13]

A systematic review has found that costs of mTBI are substantial.[14] Main contributors are costs of health care use after initial diagnosis, such as return visits to the ED. In common practice, patients are discharged to the home environment after diagnosis of mTBI with only little information on expected complaints. Ganti et al. found that approximately 5% of patients returned to the ED within 72 hours after initial ED visit, of whom one in five was admitted to the hospital for additional care.[15] Furthermore, it was suggested that if patients are aware of possibly experiencing PCS, less return visits are likely.[15]

Another important contributor of cost of mTBI are productivity costs, expressed as costs of absence from work. Previous studies on RTW in mTBI patients that presented at the ED, found that the percentage of patients with work absence decreased gradually over time, from approximately 50% shortly after trauma to 20% 3 months after trauma.[16,17] In addition, PCS was found to be an important predictor of RTW.[16] Multiple studies suggested that increased knowledge and awareness of PCS through informing and reassuring mTBI patients can be effective in preventing or reducing these symptoms.[9,10,18-20] This could potentially lead to less return visits to the ED and less delay in RTW, and thereby lower healthcare costs and costs of work absence of mTBI.

Increased knowledge and awareness of PCS can be provided through discharge instructions. The Dutch national guidelines prescribe verbal instructions supplemented with a flyer, as it was found that patients can better recall written discharge instructions than verbal discharge instructions only.[21,22] Also, an additional video has been shown effective in providing information and increasing patient knowledge.[23-25] The development of written discharge instructions and the production of a video with discharge instructions are expected to be relatively inexpensive with low implementation costs.

Insight into the effect of increased knowledge and awareness of PCS on costs of health care is currently missing. A comparison of health care costs and productivity costs of mTBI patients will facilitate the decision on whether or not additional discharge instructions should be implemented.

This study aimed to compare healthcare and productivity costs of mTBI patients who received verbal discharge instructions only and patients who received additional flyer (and video) discharge instructions up to three months after presentation to the ED.

MATERIALS AND METHODS

Study design and data source

Data on healthcare consumption and productivity loss was acquired from the Mild traumatic brain injury and Outcomes from Visual patient Education trial (MOVIE-trial).26 The MOVIE-trial is a multicenter pre- and post-implementation study of adult mTBI patients who presented at the ED of one of six participating hospitals in The Netherlands between December 1, 2015 and October 31, 2018. The pre-implementation cohort received verbal discharge instructions only.22 Respondents in the post-implementation cohort were randomly assigned to verbal instructions with additional flyer instructions or both flyer and video instructions. As no differences were found between both additional interventions (flyer versus flyer and video) within the post-implementation cohort26, the post-implementation interventions (flyer/video instructions) will be considered as one intervention and will be compared with the pre-implementation cohort (control group; verbal instructions only).

Ethical approval was obtained from the Medical Ethics Committee of the Erasmus University Medical Center Rotterdam, and written informed consent was provided by all participants before participation. The study was registered in the Netherlands Trial Registration (NTR5465).

Inclusion criteria were adult patients (≥18 years) and presence of mTBI, which was defined as every head trauma with a Glasgow Coma Scale score at first examination of 14 or 15; loss of consciousness less than 30 minutes; and post-traumatic amnesia not exceeding 24 hours. Exclusion criteria were intracranial abnormalities on CT-scan; a focal neurological deficit; insufficient command of the Dutch language; and absence of informed consent.

Discharge instructions of the usual care cohort consisted of a verbal explanation of consequences of mTBI. In the flyer/video cohort, discharge instructions consisted of the same verbal instructions, extended with a self-developed flyer with or without (depending on randomization group in the MOVIE-trial) an additional video containing the same information. The video was shown to the patient in the presence of the health care professional, and subsequently a link to the video was provided to the patient.

Questionnaires

Participants, both in the pre- and post-implementation cohort, were contacted by telephone one week and three months after presentation at the ED by one of the trained interviewers. The interview at one week included socio-demographic items like presence of chronic disease, education and family structure, but also the Rivermead Post-Concussion Questionnaire (RPQ), Short Form 12 Health Survey (SF-12), Hospital Anxiety and Depression Scale (HADS) and questions on recall. Furthermore, respondents were asked to report health care use as a consequence of mTBI, and productivity loss due to mTBI. Content of the interview was extensively explained by Hoek et al.[26], and will be explained briefly here.
Education level was categorized as ‘low’ ‘medium’ and ‘high’, based on the highest level of education that respondents reported.

The RPQ is a 16 item questionnaire that informs on PCS.[27] Total RPQ sum score lays between 0 and 64, with no golden standard on what score indicates post-concussion syndrome.[12]
The SF-12 is a measurement instrument to determine health related quality of life (HRQL).[28,29] Scores can be summarized in two measures: the Mental Component Summary score (MCSS) and the Physical Component Summary score (PCSS), both on a scale from 0-100, where a higher score indicates better health.[30]
The HADS measures symptoms of anxiety and depression. The total sum score of the HADS ranges from 0 to 42, and provides an indication of the severity of anxiety and depression symptoms.[31]
Apart from health related questionnaires, patients were also asked to recall discharge instructions by one question on each domain of discharge instructions (diagnosis, therapy and return instructions).
Questionnaires on health care use consisted of questions on the frequency of ED visits, general practitioner (GP) visits, visits to a physiotherapist, and visits to other therapists.
Furthermore, questionnaires with respect to productivity loss consisted of questions on whether or not a respondent was in paid employment, weekly work hours, and number of days of work missed due to mTBI. Students were asked the same questions with respect to their education.
In addition, one week after presentation to the ED, injury severity was determined with the Injury Severity Score (ISS), based on medical records from the patients.[32]
The interview at three months after ED visit contained the same questionnaires as the interview at 1 week.

Medical and Intervention Costs
Intervention costs per person were calculated for both video and flyer with discharge instructions.
Total health care costs included intramural and extramural medical care costs for the time period up to 3 months after ED visit. Health care use as a consequence of mTBI was based on the responses of the interview at three months. Reported care use that was presumed not to be related to mTBI, such as a gynecologist visit, was considered a self-reported error and therefore disregarded.
Unit costs of all health care activities that were reported were retrieved from a cost-reference manual.[33] An overview of all unit costs corrected for 2018 € can be found in Appendix 1 Table A1. Costs that were not available from the cost-reference manual were estimated based on current publicly available tariffs of multiple suppliers.

Productivity costs
Productivity loss at work was also reported in the questionnaires. Mean costs of work absenteeism were calculated by multiplying the number of hours of work that were missed with median wage of the Dutch workforce.[34] Calculations were based on the friction cost method, meaning that a so called friction period is assumed, after which it is assumed that replacement has been found for the employee, and therefore costs are no longer included. The friction period was set at 85 days, as advised in the Dutch cost-manual.[33] Average wage rates per age group were used (Appendix 1).[35]
Productivity costs were determined for the working age population (18-67y).

Data analyses
Results of the usual care and flyer/video cohort were compared to see whether flyer (and video) discharge instructions affected costs. Distribution of age, gender, ISS, comorbidity and education level were compared using a chi-squared test for categorical variables, Mann-Whitney U test and independent sample T-test for continuous variables. Furthermore, results of RPQ, SF-12, HADS and recall questions were compared between the usual care and flyer/video cohort. Costs of health care use and productivity costs were compared between the two main cohorts and between subgroups based on age, gender, ISS, and RPQ score, with bootstrap analyses to adjust for outliers. To control for differences in labour participation we reported both mean productivity costs of the working age population, and mean productivity costs of the employed population. In addition, possible determinants of productivity costs were analyzed using generalized linear models (GLM) with gamma distribution and log link function.

RESULTS

Study population
In total 2971 patients were assessed for eligibility for inclusion in the usual care cohort, of which 568 respondents were included (for specification, see Appendix 2 figure A1). Eventually, 384 respondents completed the 3 month interview. For the flyer/video cohort, there were 2883 patients assessed for eligibility, of whom 1118 were included. Gender and ISS of the eligible patients were comparable to the patients who were included in the study. The 3-month interview was completed by 771 respondents, of whom 50.6% received both video and flyer instruction. More details on the subgroups in the flyer/video cohort can be found in Appendix 2.
No significant differences in demographics were found between patients in the usual care and flyer/video cohorts except for level of education (Table 1), which was significantly higher for the flyer/video cohort ($p=0.001$).

Recall and Satisfaction
Correct recall of discharge instructions on therapy, diagnosis and return instructions, was found to be significantly higher for the flyer/video cohort ($p<0.001$). In addition, more patients were satisfied with instructions (78% vs. 67%) and the manner of presenting discharge instructions (82% vs. 66%) in the flyer/video cohort (Table 1).

Table 1: Patient characteristics and outcome pre- and post-implementation group

	Pre-implementation (N=384)	**Post-implementation (N=771)**	**P-value**
Patient characteristics			
Gender, male N(%)	199 (52)	406 (53)	0.789
Age (SD)	52.8 (22.5)	52.5 (19.8)	0.715
Education level N(%)			0.001*
Low	74 (19)	122 (16)	
Medium	164 (43)	270 (35)	
High	144 (38)	377 (49)	
Paid employment before injury N(%)	185 (48)	426 (55)	0.023*
ISS (SD)	2.3 (1.9)	2.5 (2.4)	0.186
Comorbidity N(%)	184 (48)	346 (45)	0.329
Outcome			
Absent from work 1wk N(%)	65 (35)	188 (44)	0.038*
Absent from work 3m N(%)	15 (8)	58 (14)	0.002*
Return Visit ED (SD)	0.0 (0.2)	0.0 (0.2)	0.006*
Visits GP (SD)	0.6 (1.0)	0.4 (1.0)	<0.001*
Visits Physiotherapy (SD)	0.7 (3.6)	0.5 (2.5)	0.539
Visits other[a] (SD)	0.1 (0.5)	0.1 (0.7)	0.010*
RPQ (SD)			
1 week	8.4 (9.6)	11.5 (11.4)	<0.001*
3 months	6.5 (8.9)	8.8 (10.9)	<0.001*
HADS (SD)			
1 week	5.9 (7.2)	9.4 (51.1)	0.039*
3 month	4.8 (6.5)	7.1 (36.5)	0.010*
SF-12 (SD)			
PCSS 1 week	39.4 (7.1)	38.8 (7.3)	0.100
PCSS 3 month	40.3 (7.3)	41.0 (6.7)	0.169
MCSS 1 week	35.5 (7.4)	36.2 (7.5)	0.184
MCSS 3 month	34.8 (7.1)	34.9 (8.1)	0.443
Correct recall N(%)			
Therapy	35 (9)	155 (20)	<0.001*
Diagnosis	98 (26)	573 (74)	<0.001*
Return instructions	32 (8)	146 (19)	<0.001*
Patient satisfaction[b] N(%)			
Instructions ~ Satisfied	256 (67)	604 (78)	<0.001*
No memory of instructions/ No opinion	82 (21)	117 (15)	
Manner ~ Satisfied	254 (66)	629 (82)	<0.001*
No memory of instructions/ No opinion	82 (21)	112 (15)	
Reassurance ~ Satisfied	305 (79)	613 (80)	0.995
No memory of instructions/ No opinion	51 (13)	103 (13)	

*Significant at a 5% level (p<0.05)

[a]Visits to other health care specialists includes: company doctor, jaw surgeon, dentist, ENT specialist, Mental coach, Neurologist, Osteopath, Eye doctor, Chronic pain therapy, EMDR therapy, Psychological physiotherapy, Psychiatrist, Acupuncture, Psychologist, Mental health care, Jaw physiotherapy, Rehabilitation doctor, Psychomotor therapist, Plastic surgeon, Mensendieck, Occupational therapy, Chiropractor

[b]Number of respondents that indicated to be satisfied/very satisfied with the instructions, manner of presenting the instructions, and whether patients felt reassured after receiving instructions

Health outcomes
Respondents with flyer/video instructions reported more symptoms on the RPQ, both at one week (11.5 vs. 8.4, p<0.001) and at 3 months (8.8 vs. 6.5, p<0.001), than respondents in the usual care cohort. The same pattern was found for the HADS, with again more reported symptoms in the flyer/video cohort at one week (9.4 vs. 5.9, p=0.039) and three months (7.1 vs. 4.8, p=0.010). However, comparing health-related quality of life between the two cohorts, measured with the SF-12, no significant difference was found for both measurement moments (Table 1).

Health care use and costs
Health care use was significantly different for the usual care and flyer/video cohort, with on average more GP visits (0.6 vs. 0.4 P=0.006) in the usual care cohort (Table 2).
Mean medical costs per person were found to be significantly (P=0.025) higher for the usual care cohort (€337) compared to the flyer/video cohort (€315) (Table 2).
Looking at subgroups based on age (Table 3), it was found that medical costs were only significantly different between the usual care and flyer/video cohort in age category 68 to 79 years old, with higher costs for usual care (€350 vs. €292).

Table 2: Health care use and costs and productivity loss and costs of the usual care group and the flyer/video group

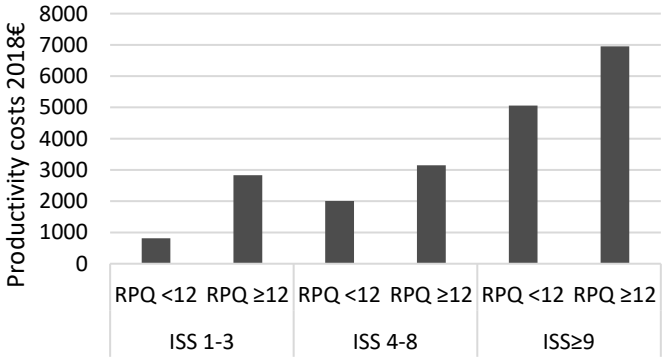
	Usual care group			**Flyer/video group**			**P**
	N	Mean (SD)/ N(%)	Costs (SD)	N	Mean (SD)/ N(%)	Costs (SD)	
Health care							
Visits ED (SD)	384	1.0 (0.2)	281 (56)	771	1.0 (0.2)	275 (45)	0.056
GP visits (SD)	384	0.6 (1.0)	20 (33)	771	0.4 (1.0)	15 (34)	0.006*
Physiotherapy visits (SD)	381	0.7 (3.6)	26 (122)	769	0.5 (2.5)	18 (87)	0.298
Other health care specialist visit (SD)	379	0.1 (0.5)	9 (38)	764	0.1 (0.7)	7 (46)	0.379
Total medical costs	376	-	337 (153)	763	-	315 (125)	0.025*
Productivity loss							
Paid employment (%)	384	185 (48)	-	771	426 (55)	-	0.023*
Absenteeism (%)	184	134 (72)	-	424	343 (81)	-	0.026*
Absent from work 1 week (%)	184	65 (35)	-	424	188 (44)	-	0.038*
Absent from work 3 months (%)	184	15 (8)	-	424	58 (14)	-	0.002
Missed work days (SD)	184	7.7 (13.2)[a]	899 (2036)/ 1264 (2318)[b]	424	12.6 (17.5)[a]	1625 (2902)/ 2223 (3194)[b]	0.001*
Number of study days lost (SD)	21	9.5 (19.0)	-	82	15.3 (20.2)	-	0.224

*Significant at a 5% level (p<0.05)
[a]Mean number of missed workdays for employed population
[b]Mean costs (SD) for working age population/Mean costs (SD) for employed population

Considering subgroups based on injury severity, it was found that costs were significantly lower for the flyer/video cohort for ISS 4-8 (€312 vs. €369), whereas other injury severity groups showed no significant difference.
Furthermore, for respondents with RPQ<12 significantly lower medical costs were found in the flyer/video cohort compared to the usual care cohort (€291 vs. €316).

Productivity costs
Table 2 shows differences in work absence aspects between the usual care cohort and the flyer/video cohort. The most important significant findings of this table are: more people in paid employment in the flyer/video cohort; higher percentage had work absenteeism; more people still absent from work at both 1 week and 3 months; almost twice as much days of work missed; almost twice as high productivity costs (taking into account difference in percentage employed respondents). These findings indicate that the manner of discharge instructions is related to productivity cost. However, GLM analyses showed no significant relation between the manner of providing discharge instructions and productivity costs. GLM analyses did show a significant effect for some other variables: ISS 4-8 and ISS ≥9 had significantly higher productivity costs compared to ISS 1-3; RPQ score ≥12 had significantly higher productivity costs compared to RPQ <12, both at 1 week and 3 months; age groups 25-44y and 45-67y had significantly higher productivity costs compared to age group 18-24y (Appendix 3 Table A4).
Considering productivity costs between the usual care cohort and the flyer/video cohort, it was found that productivity costs were significantly higher in the flyer/video cohort for the following subgroups: age 25-44y and 45-67y; males and females; medium and high education level; ISS 1-3; and for both RPQ score <12 and ≥12. Cost estimations per subgroup can be found in Table 3.
Looking at the whole working population (usual care and flyer/video), respondents with more complaints on the RPQ (≥12) were found to have higher productivity costs than respondents with less complaints (<12), for all injury severity categories (Figure 1). In addition, productivity costs were found to increase with injury severity for both RPQ<12 and RPQ≥12.

Fig. 1: Mean productivity costs working population by ISS and RPQ score 1 week after ED visit



Apart from missed days from work, respondents reported also missed days from study as a consequence of mTBI. In the usual care cohort, 58 respondents were student (15%), of whom 21 (36%) indicated to have missed days of study, with on average 9.5 missed days of study. In the flyer/video cohort, there were 144 studying respondents, of whom 82 (57%) indicated to have missed day of study, with on average 15.3 missed days of study. The difference between the two cohorts in number of study days lost was not significant.

Total costs

Costs of the intervention can be found in Table 4. Comparing total costs (medical + productivity costs), between the usual care- and flyer/video cohort, it was found that costs of the usual care cohort comprised approximately 65% of costs of the flyer/video cohort (€934 vs. €1476/€1463 excluding intervention costs, Table 3). Higher costs were caused by the increase in productivity costs in the flyer/video cohort.

Table 4: Costs intervention

Intervention N = 390 (Video)		**Control N = 771 (Folder)**	
Fixed costs		*Fixed costs*	
Production costs	€7,993.00	Design/Lay-out	€1,028.00
Place video on website	€387.00		
Variable costs		*Variable costs*	
Instruction[a] pers.	€295.00	Printing costs (1 = €0.19)	€146.00
Costs per person	€22.24		€1.52

[a]Instruction consists of 10 minute meeting with 3 medical specialists and 7 interns, in 6 hospitals

DISCUSSION

In this study medical and productivity costs of mTBI patients who presented at the ED and received verbal discharge instructions to their counterparts who received a flyer (and video) with discharge instructions.

Satisfaction, recall and PCS

Our study showed that providing mTBI patients a flyer (and video) with discharge instructions significantly improved recall of given instructions. This result is comparable to other studies that added flyer and/or video to verbal discharge instructions.[21] Correct recall of discharge instructions is relevant, as otherwise safety of sending mTBI patients home might be at stake.[36] Furthermore, similar to other studies, patients in the flyer/video cohort reported higher satisfaction with the discharge instructions.[37-39] Notably, mean RPQ scores were higher in the flyer/video cohort, whereas HRQL did not differ. Contrary to our findings, previous studies found a high correlation between RPQ items and HRQL.[40,41] This may indicate that patients had a better understanding of PCS and were better able to express them on the RPQ, while HRQL is not affected.

Table 3: Mean(SD) medical-, productivity- and total costs per patient for subgroups in 2018€

	Pre-implementation group					**Post-implementation group**					
	N	Medical costs	N	Productivity costs	Total costs[a]	N	Medical costs	N	Productivity costs	Total costs	Total costs with intervention costs
Total	376	337* (153)	256	899* (2036)	934* (1786)	763	315* (125)	561	1625* (2902)	1463* (2547)	1476 (2547)
Age groups											
18-24y	66	332 (150)	66	309 (780)	641 (905)	90	326 (159)	89	474 (921)	795 (1018)	807 (1018)
25-44y	67	314 (99)	69	955* (1726)	1282* (1807)	168	326 (148)	169	1801* (3137)	2057* (3067)	2070 (3069)
45-67y	118	350 (195)	121	1188* (2551)	1560 (2650)	298	322 (127)	303	1864* (3071)	2143 (3048)	2155 (3047)
68-79y	75	350* (151)	0	-	350* (151)	148	292* (77)	0	-	292* (77)	305 (77)
80+	50	324 (99)	0	-	324 (99)	59	295 (74)	0	-	295 (74)	310 (73)
Gender											
Male	193	326 (131)	144	877* (2067)	974* (1871)	403	306 (110)	306	1577* (3030)	1438* (2615)	1451 (2616)
Female	183	350 (173)	112	927* (2003)	911* (1697)	360	326 (140)	255	1683* (2746)	1490* (2472)	1503 (2471)
Education level											
Low	71	307 (76)	26	787 (1416)	580 (934)	121	300 (97)	59	1342 (2979)	852 (1928)	866 (1927)
Medium	161	341 (153)	113	977* (2050)	1021* (1830)	264	314 (122)	208	1655* (2950)	1580* (2722)	1593 (2722)
High	142	346 (179)	117	848* (2146)	1044* (2041)	376	321 (136)	293	1663* (2864)	1582* (2578)	1594 (2578)
ISS											
1-3	292	329 (154)	203	811* (1794)	890* (1603)	585	316 (131)	425	1346* (2530)	1256* (2217)	1269 (2216)
4-8	79	369* (150)	51	1250 (2819)	1163* (2379)	162	312* (105)	120	2217 (3298)	1878* (2883)	1891 (2883)
9+[b]	5	283 (19)	2	826 (1168)	614 (731)	16	331 (113)	16	4599 (5723)	4822 (5786)	4836 (5788)
RPQ 1 week											
<12	270	316* (99)	168	505* (1557)	626* (1282)	469	291* (82)	308	1039* (2152)	974* (1826)	986 (1826)
≥12	97	399 (242)	84	1719* (2613)	1877 (2581)	268	359 (172)	233	2368* (3446)	2284 (3218)	2296 (3218)

[a]Total costs were presented for the whole population, therefore medical costs and productivity costs do not add up to total costs, as productivity costs are only presented for the working population (18-67y)

*Indicates that costs differ significantly at a 5% level ($p<0.05$) between pre- and post-implementation group

[b]Too little cases for bootstrap analyses

Medical cost

Our findings showed that medical costs decreased significantly after implementation of flyer/video discharge instructions due to less GP visits and ED return visits. Compared to other studies, medical costs in our study appear much lower, but this can partly be explained by the health care items that were included to determine health care use and costs (e.g. in-hospital costs such as CT-scan) in other studies. Furthermore, when comparing the use of specific care items, a previous study by Pavlov et al. found one or more return visits to the ED of 32-55% depending on age within 12 months.[42] In our study, we found only 4.4% of respondents in the usual care cohort with a return visit, and 1.7% in the flyer/video cohort. However, follow-up period in our study was three months. Furthermore, it should be taken into account that the study of Pavlov et al. was based on administrative claims of patients with ICD-9 code of concussion in the United States of America, where more patients tend to go to the ED when a GP visit would be more suitable.[42,43] Our study included every patient with head trauma, and therefore patients with less severe mTBI were also included. Furthermore, in the Netherlands visiting a GP is more common and much cheaper than visiting an ED, as GP visits are fully covered by health insurance, whereas ED visits are not always fully covered. This might also explain the lower health care costs.

Productivity costs

With regards to productivity costs, our study showed that productivity costs per patient almost doubled in the flyer/video cohort, taking the difference in number of employed respondents per cohort into account. Higher productivity costs, caused by more work absenteeism among respondents in paid employment (8% work absenteeism for usual care vs. 14% for flyer/video cohort), were associated with higher age, ISS and RPQ score. A study by Silverberg et al. found a similar association, as patients with no return to work or partial return to work had more PCS compared to patients who returned to work completely.[44] Tøien et al. studied predictors of return to work in a general injury population, and also found an association between return to work and age, and return to work and ISS.[45] Possible explanations for our findings may be that increased knowledge and awareness of PCS and/or higher mean RPQ score in the flyer/video cohort may have led to more work absenteeism, which resulted in higher productivity costs. Comparison of the characteristics of the eligible patients versus the patients who were included in the study showed no difference between these groups with respect to gender and ISS. Therefore, we assume that if selection bias occurred, the effect on the results of the study is small.

Furthermore, patients in the flyer/video cohort were found to have a significant higher education level compared to patients in the usual care cohort. Previous studies showed that return to work after sustaining an mTBI is associated with educational level. [46,47] However, in our study no such association was found.

Considering overall absence of work, the percentage of respondents reporting work absence is low compared to other studies.[17] For example, De Koning et al. reported work absence at 3 months of almost 40%, which was much higher than the 8% (usual care) and 14% (flyer/video cohort) we found.[16] However, it should be noted that the study by De Koning et al. study included more severe mTBI patients (including patients with abnormalities on CT-scan).

Strengths and limitations

This study had several strengths and limitations. A major strength was that the study comprised a large study population, and measured a wide range of outcomes.

However, this study also suffered from some limitations. First, it should be taken into account that the time horizon for cost calculations was three months. This means that long term consequences or relapse were not taken into consideration. Possibly, the costs presented in this study are therefore an underestimation of actual costs of mTBI.

Second, respondents were asked to self-report health care use and lost days of work as a consequence of mTBI. Even though it was specifically asked to only report health care and lost days of work as a consequence of mTBI, it was found that respondents also reported care activities that were not related to mTBI, such as a consult with a gynecologist. Care that was clearly not related to mTBI was excluded, but it is possible that also other care activities and lost days of work were overestimated.

Third, our results could be influenced by recall bias. Patients were asked to report their absence of work after three months. It could probably be difficult to remember how many days they were absent of work three months ago. This might lead to over- or underestimation of the productivity cost.

Clinical Implications

As quality of life was not affected by the implementation of flyer/video discharge instructions, this indicates that additional instructions make respondents more aware of their complaints (reported more complaints on the RPQ). This might affect return to work, resulting in higher productivity costs.

Further research on productivity at work could provide new insights. If the usual care cohort returned to work sooner, but had more days of work with less productivity, then the difference in productivity costs between the two cohorts might be smaller due to the costs of reduced productivity.

Conclusion

The implementation of flyer (and video) discharge instructions for patients with mTBI who present at the ED reduced medical costs. Productivity costs were higher after implementation, which was associated with higher age, ISS and RPQ score. Further research on the association between awareness of complaints due to mTBI and RPQ score is recommended.

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APPENDIX 1

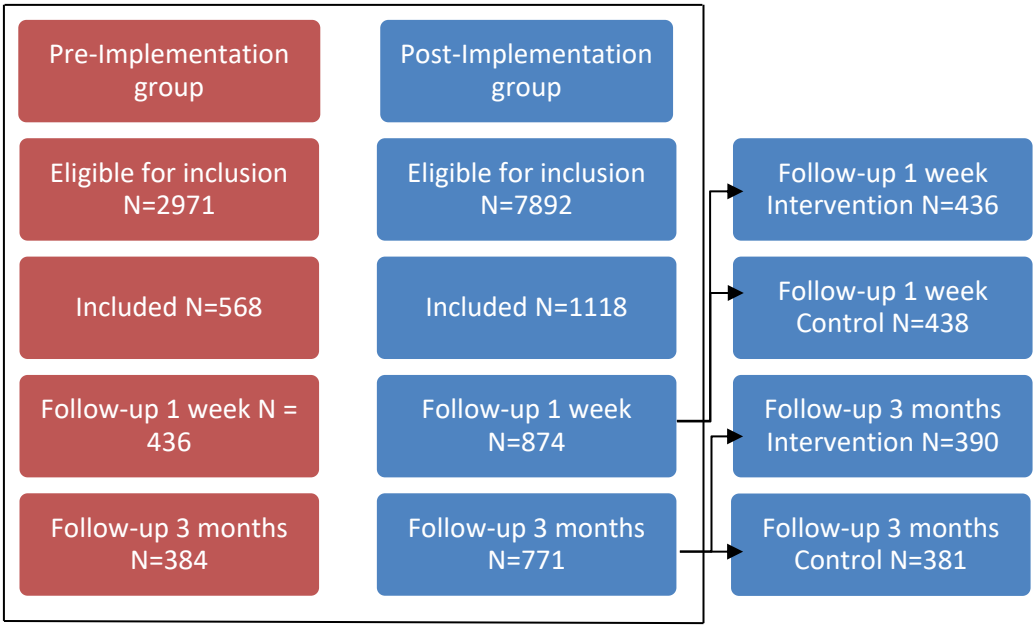
Table A1: Overview cost prices in 2018€

Item	Unit	Price
ED Visit	Visit	269.50
General Practitioner	Consult	34.34
Physiotherapist	Consult	34.34
Company doctor	Consult	50.65
Dental Surgeon	Consult	94.69
Dentist	Per hour	143.46
ENT specialist	Consult	94.69
Mental coach	Consult	98.64
Neurologist	Consult	103.01
Osteopath	Consult	78.27
Eye doctor	Consult	94.69
Chronic pain therapy	Per hour	65.90
EMDR therapy	Consult	87.06
Psychological physiotherapy	Consult	40.04
Psychiatrist	Consult	98.27
Acupuncture	Consult	84.42
Psychologist	Consult	66.59
Mental health care	Consult	17.69
Jaw physiotherapy	Consult	34.34
Rehabilitation doctor	Consult	94.69
Psychomotor therapist	Consult	63.09
Plastic surgeon	Consult	94.69
Mensendieck	Consult	31.15
Occupational therapy	Consult	34.34
Chiropractor	Consult	55.11
Wage 15-20y	Hour	6.51
20-25y	Hour	12.55
25-30y	Hour	17.21
30-35y	Hour	20.95
35-40y	Hour	24.05
40-45y	Hour	26.02
45-50y	Hour	26.91
50-55y	Hour	27.13
55-60y	Hour	27.18
60-65y	Hour	26.76
65-75y	Hour	24.36

ED: Emergency Department, ENT: Ear Nose Thought, EMDR: Eye Movement Desensitization and Reprocessing.

APPENDIX 2

Figure A1: Flowchart with post-implementation group separated in control and intervention group



Pre-implementation group:
Usual care: verbal discharge instructions (sometimes with additional written instructions)

Post-implementation group:
Control group: verbal + written discharge instructions
Intervention group: verbal + written + video discharge instructions
NOTE: Groups as discussed in the article are within the box, subdivision of post-implementation group in intervention and control group is specified outside the box

Table A2: Patient characteristics and outcome of post-implementation group, with flyer (control) and flyer + video discharge instruction (intervention) separated

	Control group* (N=381)	**Intervention group** (N=390)**	**P value**
Patient characteristics			
Gender, male N(%)	201 (52.8)	205 (52.6)	0.957
Age (SD)	51.1 (19.6)	53.7 (19.9)	0.076
Education level N(%)			0.795
Low	57 (15.0)	65 (16.7)	
Medium	136 (35.7)	134 (34.4)	
High	187 (49.1)	190 (48.7)	
Paid employment before injury N(%)	226 (59.3)	200 (51.3)	0.025*
ISS (SD)	2.5 (2.5)	2.5 (2.2)	0.759
Comorbidity N(%)	177 (46.5)	169 (43.3)	0.383
Outcome			
Absent from work 1wk	98 (43.4)	90 (45.0)	0.796
Absent from work 3m	30 (13.3)	28 (14.0)	0.861
Return Visits ED (SD)	0.0 (0.1)	0.0 (0.2)	0.174
Visits GP (SD)	0.5 (1.0)	0.4 (0.9)	0.737
Visits Physiotherapy	0.7 (2.9)	0.4 (2.1)	0.103
Visits other[a]	0.1 (0.8)	0.1 (0.7)	0.258
RPQ (SD)			
1 week	11.4 (10.7)	11.6 (12.1)	0.538
3 months	8.7 (10.5)	9.0 (11.3)	0.948
HADS (SD)			
1 week	12.2 (72.2)	6.5 (7.7)	0.207
3 month	8.8 (51.5)	5.4 (6.8)	0.369
SF-12 (SD)			
PCSS 1 week	39.1 (7.6)	38.6 (7.1)	0.243
PCSS 3 month	41.1 (6.7)	40.9 (6.8)	0.785
MCSS 1 week	36.2 (7.6)	36.2 (7.5)	0.626
MCSS 3 month	35.0 (8.2)	34.8 (8.1)	0.769
Correct recall N(%)			
Therapy	67 (17.6)	88 (22.6)	0.085
Diagnosis	286 (75.1)	287 (73.6)	0.639
Return instructions	68 (17.8)	78 (20.0)	0.446
Patient satisfaction N(%)			
Instructions[b]	295 (77.4)	309 (79.2)	0.762
No memory of instructions/ No opinion	59 (15.5)	58 (14.9)	
Manner	302 (79.3)	327 (83.8)	0.291
No memory of instructions/ No opinion	60 (15.7)	52 (13.3)	
Reassurance	300 (78.7)	313 (80.3)	0.355
No memory of instructions/ No opinion	57 (15.0)	46 (11.8)	

*Control group: verbal + written discharge instructions

**Intervention group: verbal + written + video discharge instructions

[a]Visits to other health care specialists includes: company doctor, jaw surgeon, dentist, ENT specialist, Mental coach, Neurologist, Osteopath, Eye doctor, Chronic pain therapy, EMDR therapy, Psychological physiotherapy, Psychiatrist, Acupuncture, Psychologist, Mental health care, Jaw physiotherapy, Rehabilitation doctor, Psychomotor therapist, Plastic surgeon, Mensendieck, Occupational therapy, Chiropractor

[b]Number of patients that was either satisfied or very satisfied

*Significant at a 5% level ($p<0.05$)

Table A3: Mean(SD) medical-, productivity- and total costs per patient in 2018€

	Flyer group						**Video group**					
	N	Medical costs	N	Productivity costs	Total costs[a]	Total costs with intervention costs	N	Medical costs	N	Productivity costs	Total costs	Total costs with intervention costs
Total	377	319 (134)	288	1562 (2834)	1461 (2528)	1463 (2528)	386	312 (117)	273	1691 (2977)	1465 (2568)	1488 (2568)
Age groups												
18-24y	48	334 (197)	47	457 (992)	782 (1145)	783 (1145)	42	318 (102)	42	493 (847)	811 (863)	834 (863)
25-44y	83	323 (165)	82	1231* (2217)	1538* (2302)	1539* (2302)	85	329 (130)	87	2339* (3741)	2564* (3605)	2588* (3605)
45-67y	156	325 (118)	159	2059 (3333)	2300 (3265)	2302 (3265)	142	318 (136)	144	1649 (2748)	1969 (2790)	1993 (2790)
68-79y	66	294 (69)	-	-	294 (69)	295 (69)	82	290 (83)	-	-	290 (83)	314 (83)
80+	24	310 (91)	-	-	310 (91)	311 (91)	35	285 (59)	-	-	285 (59)	309 (59)
Gender												
Male	199	309 (119)	158	1354 (2761)	1322 (2417)	1323 (2417)	204	302 (101)	148	1814 (3287)	1552 (2796)	1576 (2796)
Female	178	330 (148)	130	1815 (2911)	1617 (2645)	1619 (2645)	182	322 (131)	125	1545 (2568)	1366 (2290)	1390 (2290)
Education level												
Low	56	327* (135)	28	1550 (3347)	881 (1972)	882 (1972)	65	277* (25)	31	1154 (2646)	828 (1903)	851 (1903)
Medium	133	318 (131)	112	1609 (2877)	1620 (2700)	1622 (2700)	131	310 (112)	96	1709 (3047)	1539 (2754)	1563 (2754)
High	187	318 (136)	148	1529 (2714)	1528 (2543)	1530 (2543)	189	325 (136)	145	1801 (3012)	1634 (2618)	1658 (2618)
ISS												
1-3	291	317 (138)	219	1324 (2540)	1290 (2318)	1291 (2318)	294	314 (124)	206	1368 (2526)	1223 (2115)	1246 (2115)
4-8	79	321 (119)	63	2206 (3484)	1924 (2990)	1925 (2990)	83	304 (90)	57	2228 (3110)	1834 (2795)	1858 (2795)
9+[b]	7	373 (133)	6	3479 (4126)	3355 (4041)	3356 (4041)	9	299 (90)	10	5271 (6618)	5962 (6868)	5986 (6868)
RPQ 1 week												
<12	231	290 (67)	162	1029 (2351)	1012 (2032)	1014 (2032)	238	292 (95)	146	1050 (1915)	936 (1605)	960 (1605)
≥12	135	370 (196)	115	2346 (3319)	2225 (3099)	2227 (3099)	133	348 (143)	118	2389 (3579)	2343 (3345)	2367 (3345)

[a]Total costs were presented for the whole population, therefore medical costs and productivity costs do not add up to total costs, as productivity costs are only presented for the working population (18-67y)

*Indicates that costs differ significantly at a 5% level ($p<0.05$) between pre- and post-implementation group

[b]Too little cases for bootstrap analyses

APPENDIX 3

Table A4: GLM for productivity costs for the whole population (usual care and flyer/video group)

Variable	Exp[β] (CI)	P
Age		
18-24y	Ref.	
25-44y	2.8 (2.1, 3.7)	<0.001*
45-67y	4.3 (3.4, 5.6)	<0.001*
ISS		
1-3	Ref.	
4-8	1.5 (1.2, 1.8)	<0.001*
≥9	3.3 (1.9, 5.7)	<0.001*
RPQ score 1 week		
<12	Ref.	
≥12	1.7 (1.4, 2.1)	<0.001*
RPQ score 3 months		
<12	Ref.	
≥12	1.6 (1.3, 2.0)	<0.001*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Chapter 8

General Discussion.

GENERAL DISCUSSION

Try to imagine cycling home after a long day at work when suddenly you are hit by a car. With pain in your wrist and a bleeding wound on your head, the ambulance takes you to the emergency department of the nearest hospital. Once there, you will be moved onto an emergency room bed where several doctors and nurses take care of you. They ask all kinds of questions and make X-rays, ultrasounds and scans. After the doctor has given you a short explanation (because her pager rang again to go to the next patient) you can go home with a cast around your wrist and mild traumatic brain injury. At home, just recovered from the shock of the accident, you try to remember what the doctor explained, which painkillers do you have to take, and what is a concussion; what are the consequences, what are you allowed to do or advised not to do?

Every day, there are dozens of situations like this in every ED in the Netherlands (and worldwide). In a situation like this, the information given in the ED is not completely remembered[6], while it is important information for a safe discharge home and good recovery. But also for efficient health care, to prevent unnecessary return visits.[86]
The above mentioned example shows why providing good discharge instructions is extremely important for patients after visiting the ED.

Main Findings

Research question I – Methods of discharge instructions

The first question of this thesis pertained to the different methods of discharge instructions in the ED:

1. Does the method of discharge instructions in EDs influence comprehension and recall of patients and their caregivers?
   (chapter 2 and 6)

In order to make sure patients are discharged safely, it is important that they have a good understanding of their diagnosis, treatment, follow-up and return instructions.
There are different methods for providing discharge instructions to patients after ED visit. In chapter 2, the international literature was reviewed and a meta- analysis was performed to provide a systematic overview of the effect of different methods of providing discharge instructions in the ED on comprehension an recall. This chapter shows a wide range in correct recall in the different methods of discharge instructions. Correct recall of verbal discharge instructions ranges from 8% to 94%, of written discharge instructions from 23% to 92% and of video discharge instructions from 54% to 89%. The pooled data of the meta-analysis showed correct recall of 47% in patients who received verbal information, 58% of patients who received written information, and 67% of patients who received video information. Although overall correct recall was not significantly higher, adding video or written information to discharge instructions showed promising results in ED patients.
In chapter 6 the effect of adding video to discharge instructions in patients with MTBI was investigated in a randomized controlled trial. This study showed that adding video to discharge instructions did not improve correct recall in three domains

(diagnosis, therapy and return instructions) of discharge instructions compared to patients who received written instructions.
In chapter 7 the total cost of MTBI was compared between a pre- and post-implementation group. The pre-implantation group received discharge instructions as usual, and the post- implementation group received a flyer (and video) with discharge instructions. Secondary outcome of this study was also correct recall, and showed a significant improvement of correct recall in the post-implementation group. So, adding written discharge instructions, with or without video, improves correct recall.

Research question II – Discharge instructions in different patients groups

The second question of this thesis pertained to the effect of discharge instructions in different patients groups:

2. What are effects of written and video discharge instructions on comprehension and recall of discharge instructions in different patient groups? (chapter 3, 4 and 5)

For various patient groups, different manners of discharge instructions may be indicated. This thesis focused on two patient groups, namely patients with pain and patients with MTBI.

In chapter 3 the effect of the introduction of written discharge instructions for pain medication on patients' recall of instructions was evaluated. Before the introduction of a written leaflet with discharge instructions about analgesic use only 40% of patients correctly recalled instructions for taking analgesics. After introductions of the leaflet, significantly more patients (71%) were
able to recall the instructions correctly. In chapter 4 the same research question was answered, though now in parents of children who were discharge home with advise for analgesic use. In this study we found a significant improvement of 29% in recall as well.

To find the most effective way of providing discharge instructions the feasibility and acceptability of an online video with discharge instructions was assessed in chapter 5. Nearly all healthcare professionals (94%) and 70% of the lay persons considered a video to be a valuable addition to verbal discharge instructions. However, for 84% of patients, verbal information from
the doctor is very important. And, only 50% of patients would like to receive additional video discharge instructions. In chapter 6 no statistically significant improvement in recall was observed for video discharge instructions, indicating that adding written information to discharge instructions seems sufficient for most investigated patient groups.

Research question III – Effect of discharge instructions on cost of MTBI

The third question of this thesis studied the effect of discharge instructions on cost of MTBI:

3. What is the effect of written and video discharge instructions on health care consumption and productivity costs of Mild Traumatic Brain Injury patients? (chapter 7)

Literature suggested that educating MTBI patients may lead to less post-concussion symptoms.[87-91]
When patients with MTBI receive, at relatively low cost, clear discharge instructions, this might prevent them from seeing a medical specialist for common post-concussion symptoms and might reduce the duration of absence from work. Therefore, in chapter 7 we studied the total healthcare costs and productivity costs of MTBI patients up to three months after presentation to the ED and studied the effect of written and video discharge instructions on these costs.

The total costs of the pre-implementation group (usual care only) comprised approximately 65% of costs of the post-implementation group (written and/or video discharge instructions) (€934 vs. €1476/€1463 excluding intervention costs).
The mean productivity costs were significantly higher in the post-implementation group (€1625) compared to the pre-implementation group (€899). However, the mean medical costs per person were found to be significantly higher pre-implementation (€337) compared to post-implementation (€315). Furthermore, we found better recall and higher satisfaction with discharge instruction in the post-implementation group, without difference in health-related quality of life. Therefore, though total cost might be higher, adding written and/or video to discharge instructions should be considered in order to improve care for individual patients.

Methodological considerations
Discharge instructions
There are several methodological challenges when performing research about patient information and discharge instructions.
The most optimal way of performing clinical research in the therapeutic domain is a double blinded randomized controlled trial (RCT). However, when performing studies on patient education there are some methodological and ethical challenges to take into account. Patient education usually consists, at least, of verbal instructions of the treating physician or nurse. When performing a RCT, both groups will always receive some verbal instructions. There is a risk of performance bias; as soon as the treating physician is aware of the study and the aims of the study, this might influence the content and manner of the information provided by him or her, subsequently influencing the measured effect during the RCT.
For example in the study of chapter 6, we wanted to investigate the effect of discharge instructions by a leaflet compared to a leaflet accompanied by a video in MTBI patients. We also had the comparison with care as usual in mind (only verbal discharge instructions, sometimes with additional written information). If we had chosen for a RCT with three groups, we would not have been able to measure usual care because the treating physicians might adjust the verbal discharge instructions

as they were more aware of the importance of these instructions because of the study.
The same challenge existed for the studies in chapters 3 and 4. In these studies, we investigated the effect of written information about analgesic use. In order not to influence the treating physicians and nurses, we did not opt for a RCT, but for a pre- and post-implementation study. We did not inform the treating physicians and nurses in the pre-implementation phase about the study. To ask patients to participate in the studies, we approached the patients or parents of the patients by phone for their participation in the study. This brought the challenge to obtain informed consent in the right way and might have caused selection bias, but ultimately ensured that we could measure the effect of the introduction of a leaflet as good as possible.

Finally, when performing a RCT about discharge instructions there is an ethical dilemma. Discharge instructions are part of care for patients. It is not ethical to withhold a patient from an important part of care. Therefore, a RCT with a group patients who do not receive discharge instructions would not be ethical.

Mild Traumatic Brain Injury
A specific patient group in this thesis are patients with MTBI. To study the effect of discharge instructions on post-concussion symptoms we choose to use the Rivermead Post Concussion Questionnaire.[92, 93]
However, there is no gold standard for the interpretation of the RPQ score. There is no well-defined cut-off value with clinical relevance nor is it clear whether the RPQ score can be interpreted as a continuous variable on interval scale.[94-97]
In chapter 6 we used the total RPQ to measure post-concussion syndrome. Since most studies have used different interpretations of the RPQ to assess post-concussion symptoms, comparability across studies is severely hampered. However, we believe that in our study the RPQ score is suitable because we use the same classifications in both groups at both measure points.

Many MTBI patients suffer from post-concussion symptoms, such as headache, attention difficulties, fatigue and memory problems.[98] These symptoms may all negatively influence correct recall and comprehension of discharge instructions, and this influence may vary with the nature and severity of MTBI. The different nature and severity of the MTBI in our patients groups might have influenced the results. The difference in severity of MTBI cases need to be taken in account when performing research on MTBI patients. This makes performing research on recall of discharge instructions in this specific population more challenging.

Response
Questionnaires are often used when performing research about discharge instructions. A high response is very important for the value of the research. Moreover, there is always a risk of attrition bias due to the loss of respondents during the follow-up of the studies. However, it is a challenge to obtain a high response. A lower response may affect the results of a study. For example in MTBI patients, patients with less severe of no more post-concussion symptoms might withdraw from participating in the study because they might feel that they are no longer part of the study. The post-concussion symptoms in the included patients might be an overestimation. In the studies of chapters 3, 4 and 6, a protocol has been developed

to make the response as high as possible, e.g. to call back the patients a number of times or to contact them again on a regular basis. It is important to find a balance between contacting the patient to participate in the study and the burden for patients because of these extra contacts.

Societal impact

Although the findings of our studies were ambiguous as to which method for discharge instruction resulted in the highest recall of the instructions, our findings did point out that giving verbal discharge instructions only is not the optimal manner. To continue the care for patients we started the development of the "SEHzorg.nl" website and accompanying application.

In December 2015, a grant was obtained to develop a website to improve patient education after an ED visit. Shortly after the assignment of this grand we started cooperation with the Dutch Society of Emergency Physicians (DSEP) to ensure continuity after the website had been developed.

For the development of the content of the website, we developed a protocol to guarantee optimal quality. Before new topics are posted on the website, they are assessed by two editorial boards. The first editorial board consists of Emergency physicians with affinity for patient education and Emergency physicians from various committees of the DSEP. In addition, the documents are assessed by the second editorial board, which consists of lay people. Since there is no patient association for patients who visit the ED, we asked healthy volunteers to join this editorial board. The first board is important and responsible for the medical content and correctness of the texts based on current medical literature. Participants in this board are from different ED's in the Netherlands which broadens the support from the text. The second editorial board is just as important, and this editorial board consists of different people with very diverse backgrounds in order to ensure that the texts are easy to understand for every patient in the ED.

On May 22, 2017, www.SEHzorg.nl and accompanying application were officially launched in The Hague by Pia Dijkstra, Member of Parliament for D66. There was also an official press release by the Erasmus MC and the DSEP and it was covered on national television. All of this resulted in more and more physicians and nurses referring patients to the website to improve patient care.

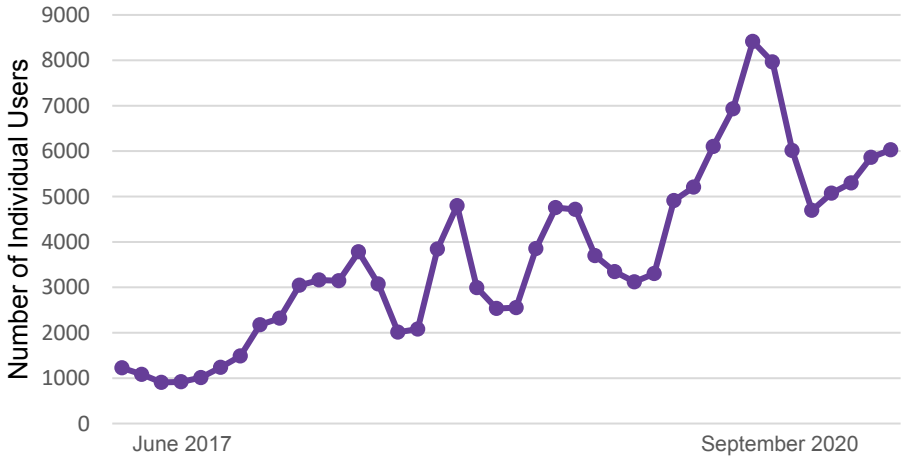
Another grant was obtained in August 2017, to expand the website with ten videos. The website continues to improve, and new topics will be added every year. Ideally, each page of the website will consist of a written text with a video at the top of the page which covers the same information. Although our studies suggest that adding a video is only of additional value in discharge instructions, other studies have shown that the use of video, and especially animations, is important, especially for patients with a low literacy level.[99]

The website and application are now under responsibility of de patient information committee of DSEP, which was established in December 2018.

Most importantly, the website and applications are now available for al ED patients in the Netherlands. Treating physicians can refer their patients to the website and application. Patients can read the information again at home, but also share the information with their cares. Since the launch of the website, it has been visited by

more than 140.000 individual users, and there is still progress in the number of visitors each month (figure 8.1)

Figure 8.1: Individual visitors at SEHzorg.nl, monthly form June 2017 till September 2020



Recommendations
At the end of this chapter, we would like to make some recommendations for researchers, health professionals, and policy makers. We will describe these point by point below.

Recommendations for researchers:

- Performing research about discharge instructions is challenging because by doing research you can already influence the treating physicians and nurses and thereby influence the effect to be studied. Take this into account when designing your research.
- When conducting research into post-concussion symptoms in MTBI patients, there is no unambiguous method to measure those symptoms. Use the same method within different groups, so the symptoms between those groups can at least be compared
- Because of the course of MTBI, follow-up of one or two years would be ideal to investigate the effect on absence of work and productivity at work.

Recommendations for clinical practice:

- Providing discharge instructions to patients is an important part of care in the ED.
- It is important that verbal information by a treating physician and / or nurse remains part of the discharge instructions after ED visit.
- Verbal discharge instructions only are not enough, as it will lead to insufficient comprehension and recall of those instructions.

- Written information should be added to verbal discharge instructions, and may be augmented with video information.
- Even though reported post-concussion symptoms increase, written and / or video discharge instructions should be added to verbal discharge instructions in MTBI patients because they achieve less return visits and higher patient satisfaction.

Recommendations for policy makers:

- Providing discharge instructions to patients is an important part of care in the ED and, thus, should be an integral element in care protocols.
- Mild traumatic brain injuries have severe consequences for daily functioning and participation, especially at work with increased risk of reduced work performance and sickness absence. Timely and adequate information delivered at EDs may have a profound impact on these societal consequences. Clinical care should be facilitated to address patient's needs for information on functioning and participation.

Conclusion

Providing discharge instructions to patients is an important part of care in the ED. Giving verbal discharge instructions alone is not sufficient. Although providing additional discharge instructions can lead to more reporting of symptoms and higher costs in MTBI patients, the higher recall, better patient satisfaction and reduced number of return visits are very important for the individual patient. Adding written or video information to discharge instructions, for example by referring to SEHzorg.nl, can improve the care for the patient after a visit to the ED.

…. At home, just recovered from the shock of the accident, you try to remember what the doctor explained. You read the leaflet you received from the treating physician and nurse and go to SEHzorg.nl on your mobile phone. Fortunately, you find the information about the cast on your wrist and about the concussion. This will help you for the best possible recovery.

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Chapter 9

Summary / Samenvatting

SUMMARY

Introduction

An Emergency Department (ED) is a department at a hospital where a diverse patient population with a broad spectrum of acute medical problems is being treated. If patients are discharged home after an ED visit they will receive discharge instructions. Discharge instructions can be divided in four domains: discharge instructions about diagnosis and cause, care given in the ED, care after the ED visit, and instructions on when to return to the ED.

Sufficient comprehension and recall of discharge instructions in the ED may be challenging, due to multiple factors, such as the stressfulness of the acute event and the limited time available for discharge instructions. Deficits in recall and comprehension of discharge instructions raises concerns about compliance and patient safety after discharge. In addition, it may lead to unnecessary return visits to the ED or General Practitioner-visits, which in their turn increase the burden on the healthcare system.

Discharge instructions are usually provided verbally, sometimes accompanied with written information. Nowadays, modern communication tools, such as video applications or various online websites, can be added to discharge instructions. However, there is no national or international standard guidance on how to provide discharge instructions. Therefore, it is important to investigate the effect different methods of discharge instructions in order to determine the optimal way of providing discharge instructions for each patient group after an ED visit.

This thesis focuses on two patient groups that are frequently treated at the ED, namely patients with Mild Traumatic Brain Injury (MTBI) and patients with pain. Patients with MTBI may suffer from post-concussion symptoms, which may hamper recall and comprehension of information. Moreover, in analgesic use, it is important that patients know which dose and in which frequency they should use the medication if they are in pain. However, having pain may impair memory, and may thereby impair recall of discharge instructions.

Aim and research questions

The main aim of this thesis was to expand our knowledge about patient education in the ED. The thesis consists of two major parts. In part 1 studies are presented that focus on comprehension and recall of standardized discharge instructions. In part 2 a novel strategy for video discharge instructions is evaluated.

The aim of this thesis will be explored using the following three research questions.

1. Does the method of discharge instructions in emergency departments influence comprehension and recall of patients and their caregivers?
2. What are effects of written and video discharge instructions on comprehension and recall of discharge instructions in different patient groups?
3. What is the effect of written and video discharge instructions on health care consumption and productivity costs of MTBI patients?

Part I- Introducing standardized discharge instructions
In **chapter 2** the international literature was reviewed and a meta- analysis was performed to provide a systematic overview of the effect of different methods of providing discharge instructions in the ED on comprehension an recall. This chapter shows a wide range in correct recall for the different methods of discharge instructions. Meta-analysis showed correct recall of 47% in patients who received verbal information (95% confidence interval (CI) 32.2%-61.7%), 58% of patients who received written information (95% CI 44.2%-71.2%), and 67% of patients who received video information (95% CI 57.9%-75.7%). Although overall correct recall was not significantly higher, adding video or written information to discharge instructions showed promising results in ED patients.

In **chapter 3** the effect of the introduction of written discharge instructions for pain medication on adult patients' recall of instructions was evaluated. Before the introduction of a written leaflet with discharge instructions about analgesic use only 40% of patients correctly recalled instructions for taking analgesics. After introductions of the leaflet, significantly more patients (71%) were able to recall the instructions correctly. In **chapter 4** a similar study as in chapter 3, except that the study population consisted of parents of children who were discharge home with advise for analgesic use. Among this study population we found a significant improvement of 29% in recall of discharge instructions when written discharge instructions were provided.

Part II - Evaluating video discharge instructions
To find the most effective way of providing discharge instructions the feasibility and acceptability of an online video with discharge instructions was assessed in **chapter 5**. Nearly all healthcare professionals (94%) and 70% of the lay persons considered a video to be a valuable addition to verbal discharge instructions. However, 84% of patients indicated that verbal information from the doctor is very important. And, only 50% of patients would like to receive additional video discharge instructions.

In **chapter 6** the effect of adding video to discharge instructions in patients with MTBI was investigated in a randomized controlled trial. This study showed that severity of post-concussion symptoms in patients with MTBI who received standard care was similar to those who received video information in addition to standard care. Also, there was no difference in health-related quality of life, return visits and patient satisfaction and recall of discharge instructions between the control and intervention group.

In **chapter 7** the total cost of MTBI up to three months after presentation was compared between a pre- and post-implementation group. The total costs of the pre-implementation group (standard care only) were higher compared to the costs of the post-implementation group (written and/or video discharge instructions) (€934 vs. €1476/€1463 excluding intervention costs). The mean productivity costs were significantly higher in the post-implementation group (€1625) compared to the pre-implementation group (€899). However, the mean medical costs per person were found to be significantly higher pre-implementation (€337) compared to post-implementation (€315). And we found better recall of and higher satisfaction with discharge instructions in the post-implementation group.

Discussion

The main aim of this thesis was to expand our knowledge about patient education in the ED. We found that giving verbal discharge instructions alone is not sufficient. Providing additional discharge instructions can lead to an increase in reporting symptoms and higher costs in MTBI patients. However, the higher recall of discharge instructions, better patient satisfaction and less return visits indicate important benefits to the individual patient and the health care system. Adding written or video information to discharge instructions, for example by referring to SEHzorg.nl, can improve the care for the patient after a visit to the ED.

This thesis also showed that there are several methodological challenges when performing research about patient information and discharge instructions. There is a risk of performance bias; as soon as the treating physician is aware of the study, this might influence the content and manner of the information provided by him or her. As a result, the effect measured during the randomized controlled trial (RCT) might be influenced. Therefore, for the studies in chapters 3, 4 and 7 we choose a pre- and post-implementation design instead of a RCT. As a consequence of this design, the patient characteristics of the pre- and post-implementation group are not completely comparable.

Also for this reason, we did not inform the treating physicians about the study in the studies of chapters 3 and 4. This brought the challenge to obtain informed consent and might have caused selection bias, for example because not all patients could be reached by phone, but ultimately ensured that we could measure the effect of the introduction of a leaflet with a low risk of performance bias.

Finally, performing a RCT about discharge instructions imposes an ethical dilemma. Discharge instructions are part of care for patients. It is not ethical to withhold an important part of care from a patient. Therefore, a RCT with a group of patients who do not receive discharge instructions would not be ethical. The effect of verbal discharge instructions only could not be measured.

Social impact

To improve the care for patients we developed a website and accompanying application with discharge instructions for patients after an ED visit. On May 22, 2017, www.SEHzorg.nl and accompanying application were officially launched by Pia Dijkstra (member of the Dutch parliament). Content of the website was critically reviewed by two editorial boards; a professional editorial board, consisting of emergency physicians with affinity for patient education and Emergency physicians from various committees of the Dutch Society of Emergency Physicians (DSEP) and a second editorial board, which consisted of lay people. The website and application are now under responsibility of de patient information committee of DSEP. Most importantly, the website and applications are now available for all ED patients in the Netherlands.

Recommendations

For researchers:

- Performing research about discharge instructions is challenging because of performance bias: by doing research you can already influence the treating physicians and nurses and thereby influence the effect to be studied. Be aware of this when designing your research.
- When conducting research into post-concussion symptoms in MTBI patients, there is no unambiguous method to measure those symptoms. Use the same method within different groups, so the symptoms between those groups can at least be compared.
- Because of the course of MTBI, follow-up of one or two years would be ideal to investigate the effect on absence of work and productivity at work.

For clinical practice:

- Providing discharge instructions to patients is an important part of care in the ED.
- It is important that verbal information by a treating physician and / or nurse remains part of the discharge instructions after ED visit.
- Verbal discharge instructions only are not enough, as it will lead to insufficient comprehension and recall of those instructions.
- Written information should be added to verbal discharge instructions, and may be augmented with video information.
- Even though reported post-concussion symptoms increase, written and / or video discharge instructions should be added to verbal discharge instructions in MTBI patients because they achieve less return visits and higher patient satisfaction.

Recommendations for policy makers:

- Providing discharge instructions to patients is an important part of care in the ED and, thus, should be an integral element in care protocols.
- MTBI have severe consequences for daily functioning and participation, especially at work with increased risk of reduced work performance and sickness absence. Timely and adequate information delivered at EDs may have a profound impact on these societal consequences. Clinical care should be facilitated to address patient's needs for information on functioning and participation.

SAMENVATTING

Introductie
De Spoedeisende Hulp (SEH) is een afdeling van het ziekenhuis waar een diverse patiëntenpopulatie met een breed spectrum aan acute medische problemen wordt behandeld. Als patiënten na een bezoek aan de SEH naar huis mogen dan ontvangen ze ontslaginstructies. Ontslaginstructies kunnen worden onderverdeeld in vier domeinen: ontslaginstructies over de diagnose en oorzaak, over de zorg gegeven op de SEH, over de zorg na het SEH-bezoek en instructies over wanneer terug te komen naar de SEH.

Het voldoende kunnen begrijpen en onthouden van ontslaginstructies op een SEH kan door meerdere factoren worden beïnvloed, bijvoorbeeld door stress na de (acute) gebeurtenis of de beperkte tijd die beschikbaar was voor ontslaginstructies. Niet goed kunnen begrijpen en onthouden van de ontslaginstructies kan leiden tot verminderde therapietrouw van patiënten, maar ook verminderde patiëntveiligheid na ontslag. Daarnaast kan het leiden tot onnodige extra bezoeken aan de spoedeisende hulp of huisarts, wat vervolgens het zorgstelsel extra belast.

Ontslaginstructies worden meestal mondeling gegeven, soms in combinatie met schriftelijke informatie. Tegenwoordig kunnen moderne communicatiemiddelen zoals video, applicaties of verschillende online websites worden toegevoegd aan deze ontslaginstructies. Er zijn echter geen nationale of internationale standaardrichtlijnen voor het geven van ontslaginstructies. Daarom is het belangrijk om te onderzoeken wat het effect is van de manier waarop ontslaginstructies worden gegeven op het onthouden en begrijpen van deze instructies om zo de optimale manier te bepalen voor het geven van ontslaginstructies voor verschillende patiëntengroepen na een bezoek aan de SEH.

Dit proefschrift richt zich op twee patiëntengroepen die veel op de spoedeisende hulp worden behandeld, namelijk patiënten met licht traumatisch hoofd/hersenletsel (LTH) en patiënten met pijn. Patiënten met LTH kunnen last hebben van symptomen die het onthouden en begrijpen van informatie kunnen belemmeren. Bij patiënten die pijnstillers gebruiken is het belangrijk dat de patiënten weten welke dosis en met welke frequentie ze de medicatie moeten gebruiken. Het hebben van pijn kan echter het geheugen aantasten en dit kan het onthouden van ontslaginstructies belemmeren.

Doel en onderzoeksvragen
Het belangrijkste doel van dit proefschrift was om de kennis over het effect van patiëntvoorlichting op de SEH uit te breiden. Het proefschrift bestaat uit twee delen. In deel 1 worden studies gepresenteerd die zich richten op het begrijpen en onthouden van gestandaardiseerde ontslaginstructies. In deel 2 wordt een nieuwe strategie voor video-ontladingsinstructies geëvalueerd.

Het doel van dit proefschrift wordt onderzocht aan de hand van de volgende drie onderzoeksvragen.

1. Heeft de methode van ontslaginstructies op de SEH invloed op het begrip en het onthouden van deze instructies door patiënten en hun verzorgers?
2. Wat zijn de effecten van schriftelijke en video ontslaginstructies op het begrijpen en onthouden van deze instructies bij verschillende patiëntengroepen?
3. Wat is het effect van schriftelijke en video-ontslaginstructies op het zorggebruik en de productiviteitskosten van LTH-patiënten?

Deel I - Invoering van gestandaardiseerde ontslaginstructies
In **hoofdstuk 2** wordt de internationale literatuur beschreven en is een meta-analyse uitgevoerd om een systematisch overzicht te geven van het effect van verschillende methode van ontslaginstructies op het begrip en onthouden van deze instructies.
Dit hoofdstuk laat zien dat er een grote spreiding is in het onthouden van instructies tussen verschillende methoden van het geven ontladingsinstructies. De meta-analyse toonde dat 47% van de patiënten die mondelinge informatie ontvingen dit correct onthouden hadden (95% betrouwbaarheidsinterval (BI) 32,2% - 61,7%), van de patiënten die schriftelijke informatie kregen was dit 58% (95% BI 44,2% - 71,2%) en van de patiënten die video-informatie kregen was dit 67% (95% BI 57,9% - 75,7%). Hoewel het onthouden van de ontslag instructies
niet significant beter was, liet het toevoegen van video of schriftelijke informatie aan de ontslaginstructies na een SEH bezoek veelbelovende resultaten zien.

In **hoofdstuk 3** werd het effect van schriftelijke ontslaginstructies voor pijnstillers op het onthouden van deze instructies door volwassen patiënten onderzocht.
Vóór de introductie van een folder met ontslaginstructies over het gebruik van pijnstillers onthield 40% van de patiënten de instructies voor het innemen. Na introductie van de folder waren er significant meer patiënten (71%) die de instructies konden onthouden. **Hoofdstuk 4** beschrijft een soortgelijk onderzoek als in hoofdstuk 3, echt bij deze studie bestond de onderzoekspopulatie uit ouders van kinderen die naar huis mochten na SEH-bezoek. In deze onderzoekspopulatie vonden we dat percentage ouders dat de ontslaginstructies over pijnstillers goed had onthouden met 29% verbeterde wanneer schriftelijke ontslaginstructies werden gegeven.

Deel II - Evaluatie van video-ontladingsinstructies
Om de meest effectieve manier te vinden om ontslaginstructies te geven, werd in **hoofdstuk 5** de haalbaarheid en aanvaardbaarheid van een online video met ontslaginstructies onderzocht. Bijna alle zorgverleners (94%) en het grootste deel van de leken (70%) vonden een video een waardevolle toevoeging op de mondelinge ontslaginstructies. Wel gaf 84% van de patiënten aan dat mondelinge

informatie van de dokter erg belangrijk is. Slechts 50% van de patiënten zou graag aanvullend video ontslag instructies ontvangen.

In **hoofdstuk 6** werd het effect van het toevoegen van video aan ontslaginstructies bij patiënten met LTH onderzocht in een gerandomiseerde studie met controlegroep. Deze studie toonde aan dat de ernst van de postcommotionele symptomen bij patiënten met LTH die standaardzorg ontvingen vergelijkbaar was met patiënten die een video met ontslag instructies te zien kregen aanvullend op de standaardzorg. Ook was er geen verschil in gezondheidsgerelateerde kwaliteit van leven, extra bezoeken aan de SEH of huisarts, patiënttevredenheid en het onthouden van ontslaginstructies tussen de controle- en interventiegroep.

In **hoofdstuk 7** werden de totale kosten van LTH tot drie maanden na presentatie op de SEH vergeleken tussen een pre- en postimplementatiegroep. In de pre-implementatie groep kregen patiënten alleen mondelinge ontslag instructies (standaard zorg), in de post-implementatiegroep werd hier een folder en video aan toegevoegd. De totale kosten (medische en productiviteitskosten) van de pre-implementatiegroep (alleen standaardzorg) waren hoger in vergelijking met de kosten van de postimplementatiegroep (schriftelijke en / of video-ontslaginstructie) (€ 934 vs. €1476 / €1463 exclusief interventiekosten). De gemiddelde productiviteitskosten waren significant hoger in de post-implementatiegroep (€1625) vergeleken met de pre-implementatiegroep (€899). De gemiddelde medische kosten per persoon bleken echter significant hoger vóór implementatie (€337) in vergelijking met postimplementatie (€ 315). In de post-implementatie groep werden de ontslaginstructies wel beter onthouden en waren de patiënten tevredener over de ontslaginstructies vergeleken met de post-implementatiegroep.

Discussie
Het doel van dit proefschrift is het uitbreiden van onze kennis over patiëntvoorlichting op de SEH. We vonden dat het geven van mondelinge ontslaginstructies alleen niet voldoende is. Hoewel het geven van aanvullende ontslaginstructies kan leiden tot het meer rapporteren van postcommotionele symptomen en hogere kosten bij LTH-patiënten, duidt het beter onthouden van de ontslaginstructies, de hogere patiënttevredenheid en minder extra medische bezoeken op belangrijke voordelen voor de individuele patiënt en het gezondheidszorgsysteem.
Het toevoegen van schriftelijke of video-informatie aan ontslaginstructies, bijvoorbeeld door te verwijzen naar SEHzorg.nl, kan de zorg voor de patiënt na een bezoek aan de SEH verbeteren.

Dit proefschrift toonde ook aan dat er verschillende methodologische uitdagingen zijn bij het uitvoeren van onderzoek naar patiëntinformatie en ontslaginstructies. Er bestaat een risico op performance bias; zodra de behandelende arts op de hoogte is van het onderzoek en de doelstellingen van het onderzoek, kan dit van invloed zijn op de inhoud en wijze van de door hem verstrekte ontslaginstructies. Dit kan invloed hebben op het te meten effect van een gerandomiseerde gecontroleerde trial (RCT). Daarom kiezen we voor de onderzoeken in hoofdstuk 3, 4 en 7 voor een pre- en post-implementatie studie in plaats van een RCT.
Vanwege deze reden hebben we de behandelende artsen niet geïnformeerd over het onderzoek in de studies van hoofdstuk 3 en 4. Dit bracht wel de uitdaging met

zich mee om geïnformeerde toestemming te verkrijgen van de patiënt en heeft mogelijk selectiebias veroorzaakt, bijvoorbeeld omdat niet alle patiënten telefonisch bereikbaar waren. Echter, deze werkwijze zorgde er uiteindelijk voor dat we het effect van het implementeren van een patiëntvoorlichtingsfolder konden meten met een laag risico op performance bias.

Ten slotte zorgt het uitvoeren van een RCT over ontslaginstructies voor een ethisch dilemma. Ontslaginstructies zijn onderdeel van de zorg voor patiënten. Het is niet ethisch om een patiënt een belangrijk deel van de zorg te onthouden. Daarom zou een RCT met een groep patiënten die geen ontslaginstructies krijgt niet ethisch zijn. Het effect van alleen mondelinge ontslaginstructies kon daarom niet worden gemeten.

Sociale impact
Om de zorg voor SEH patiënten te verbeteren hebben we een website en bijbehorende applicatie ontwikkeld met ontslaginstructies voor patiënten na een bezoek aan de SEH. Op 22 mei 2017 is www.SEHzorg.nl en bijbehorende applicatie officieel gelanceerd.
De inhoud van de website werd kritisch beoordeeld door twee redacties; een professionele redactie, bestaande uit SEH-artsen met affiniteit voor patiëntvoorlichting en SEH-artsen uit diverse commissies van de Nederlandse Vereniging van Spoedeisende Hulpartsen (NVSHA) en een tweede redactie bestaande uit leken. De website en applicatie vallen nu onder de verantwoordelijkheid van de patiëntenvoorlichtingscommissie van de NVSHA. De website en applicaties zijn nu beschikbaar voor alle SEH patiënten in Nederland.

Aanbevelingen
Aan het einde van dit proefschrift willen we enkele aanbevelingen doen voor onderzoekers, medewerkers in de gezondheidszorg en beleidsmakers.

Voor onderzoekers:

- Onderzoek doen naar ontslaginstructies is uitdagend vanwege performance bias: alleen al door onderzoek te doen kun je invloed uitoefenen op de behandelend artsen en verpleegkundigen en daarmee op het te onderzoeken effect. Houd hier rekening mee bij het ontwerpen van uw onderzoek.
- Bij het doen van onderzoek naar postcommotionele symptomen bij LTH patiënten is er geen eenduidige methode om die symptomen te meten. Gebruik dezelfde methode binnen verschillende groepen, zodat de frequentie en ernst van de postcommotionele symptomen tussen die groepen in ieder geval vergelijkbaar zijn.
- Vanwege het beloop van LTH zou een follow-up van één of twee jaar ideaal zijn om het effect van ontslaginstructies op het verzuim en de productiviteit op het werk te onderzoeken.

Voor klinische praktijk:

- Zie het geven van ontslaginstructies aan patiënten als een belangrijk onderdeel van de zorg op de SEH.

- Het is belangrijk dat mondelinge informatie door een behandelend arts en / of verpleegkundige onderdeel blijft van de ontslaginstructie na een bezoek aan de SEH.
- Alleen mondelinge ontslaginstructies zijn niet voldoende, omdat dit zal leiden tot onvoldoende begrip en onthouden van die instructies.
- Schriftelijke informatie moet worden toegevoegd aan mondelinge ontslaginstructies, en kan worden aangevuld met video-informatie.
- Hoewel het kan leiden tot meer gerapporteerde postcommotionele symptomen na een LTH, moeten schriftelijke en / of video-instructies worden toegevoegd aan mondelinge ontslaginstructies bij LTH-patiënten omdat ze zorgen voor minder extra medische bezoeken en een hogere patiënttevredenheid.

Aanbevelingen voor beleidsmakers:

- Het geven van ontslaginstructies aan patiënten is een belangrijk onderdeel van de zorg op de SEH en zou daarom een integraal onderdeel moeten zijn van zorgprotocollen.
- LTH heeft ernstige gevolgen voor het dagelijks functioneren en participatie in de maatschappij, vooral op het werk met een verhoogd risico op verminderde werkprestaties en ziekteverzuim. Tijdige en adequate informatie die op de SEH wordt gegeven kan een grote impact hebben op deze maatschappelijke gevolgen.
- Klinische zorg moet worden gefaciliteerd om te voorzien in de behoefte van de patiënt aan informatie over functioneren en participatie.


SEH
Zorg na Spoedeisende Hulp

Appendices

I. List of publications
II. About the author
III. PhD Portfolio
IV. Dankwoord

I. LIST OF PUBLICATIONS

Publications and manuscripts printed in this thesis

Hoek AE, Anker SCP, van Beeck EF, Burdorf A, Rood PPM, Haagsma JA. Patient Discharge Instructions in the Emergency Department and Their Effects on Comprehension and Recall of Discharge Instructions: A Systematic Review and Meta-analysis. Ann Emerg Med. 2020, Mar;75(3):435-444.

Hoek AE, De Ridder MA, Bayliss A, Patka P, Rood PPM. Effective strategy for improving instructions for analgesic use in the emergency department. Eur J Emerg Med. 2013 Jun;20(3):210-3

Hoek AE, Bouwhuis MG, Keyzer CMG, Oosterbrink R, Bockhorst EF, Bakker B, Haagsma JA, Rood PPM. Effect of written and video parental discharge instructions on recall for analgesic use in children: a pre/post implementation study. Eur J Emerg Med. 2021 Jan;28(1):49-49.

Hoek AE, Hamer MVD, Deelstra CK, Beeck EFV, Dippel DWJ, Haagsma JA, Rood PPM. Attitude of patients, healthcare professionals, and noninjured lay persons towards online video instructions on mild traumatic brain injury: a cross-sectional study. Int J Emerg Med. 2017 Dec;10(1):25.

Hoek AE, Joosten M, DWJ Dippel, Van Beeck EF, Van den Hengel L, Dijkstra B, Papathanasiou D, Van Rijssel D, Van den Hamer M, Schuit SCE, Burdorf A, Haagsma JA, Rood PPM. Effect of video discharge instructions for mild traumatic brain injury patients in the emergency department: A randomized controlled trial. Ann Emerg Med. 2021 Mar; 77(3):327-337

Hoek AE / Geraerds AJLM, Rood PPM, Joosten M, DWJ Dippel, Van Beeck EF, Van den Hengel L, Dijkstra B, Papathanasiou D, Van Rijssel D, Van den Hamer M, Schuit SCE, Burdorf, A, Haagsma JA, S. Polinder. The effect of written and video discharge instructions after mild traumatic brain injury on health care costs and productivity costs. Journal of Head Trauma Rehabilitation, Submitted December 2020

Other publications

N. Azizi, E. ter Avest, A.E. Hoek et al., Optimal anatomical location for needle chest decompression for tension pneumothorax: A multicenter prospective cohort study, Injury, October 2020. https://doi.org/10.1016/j.injury.2020.10.068

Mo Abbas, Vanessa Brown, Arie P. Rietveld en Amber E. Hoek. Een marathonloper met rabdomyolyse. Nederlands Tijdschrift voor Geneeskunde 2019;163:D2848.

S.E. Rosier, R. Otten J.J. Brugts, A.E. Hoek. Allergic acute coronary syndrome in exercise-induced anaphylaxis. The Netherlands Journal of Medicine. November 2018, Vol. 76, No. 9

A.E. Hoek, M. van den Hamer, C.K. Deelstra, E.F. van Beeck, D.W.J. Dippel, J.A. Haagsma, P.P.M. Rood. Attitude of patients, healthcare professionals, and noninjured lay persons towards online video instructions on mild traumatic brain injury: a cross-sectional study. Int J Emerg Med. 2017 Dec;10(1):25.

Peeters SY, Hoek AE, Mollink SM, Huff JS. Syncope: risk stratification and clinical decision making. Emerg Med Pract. 2014 Apr;16(4):1-22.

II. ABOUT THE AUTHOR

Amber Hoek was born in Rotterdam, the Netherlands, on May 15th,1985. After finishing secondary school 'Comenius College' in Capelle aan den IJssel in 2003, she started studying Medicine at the Erasmus Medical Center in Rotterdam. After her study she worked as 'ANIOS' at the Emergency Department (ED) of the Erasmus Medical Center in 2009. At this time she started a research project about discharge instructions at the ED (under supervision of dr. Pleunie Rood). During this period she became enthusiastic about patient education in the ED, by daily practice and in research.

After an Emergency Medicine residency in HAGA Hospital in The Hague (2011-2013), she returned to Rotterdam, in 2014, to work as an emergency physician at the Erasmus University Medical Center. Once back she combined her work as an emergency physician with research on patient education in the ED, under supervision of dr. Pleunie Rood and dr. Juanita Haagsma. This resulted in a PhD track under supervision of prof. dr. ir. Burdorf, which resulted in this thesis. Currently, she is still working as an emergency physician and researcher at the Erasmus Medical Center.

III. PhD PORTFOLIO

Name PhD student:	Amber Hoek
Erasmus MC Department:	Emergency Department
PhD period:	2015-2020
Promotor(s):	Prof. Dr. Ir. A. Burdorf
Supervisor:	Dr. P.P.M. Rood
	Dr. J.A. Haagsma

1. PhD training

	Year	Workload (ECTS)
General courses		
Workshop work with Endnote	2014	
Systematic Literature Retrieval in Pubmed	2015	
Workshop Grant Writing (Viroscience), ErasmusMC	2015	
Cursus OpenClinica	2015	0.5
NIHES Erasmus Summer Programme: Principles of Research in Medicine	2015	0.7
NIHES Erasmus Summer Programme: Introduction to Data-analysis	2015	0.7
BROK ('Basiscursus Regelgeving Klinisch Onderzoek')	2016	1.5
Recertification BROK	2020	
Research Integrity	2016	0.25
Biomedical English Writing and Communication	2018-2019	3.0
Specific courses (e.g. Research school, Medical Training)		
Teach the Teacher course CAE 'Essentials of Simulation'	2016	0.5
Teach the Teacher III	2017	0.25
Basics of Qualification of Teaching (BKO)	2018	2.0
- Workshop 'Tentamenvragen maken'	2017	
- Workshop 'Hoe ontwikkel ik een e-module'	2017	
Presentations at (inter)national conferences		
6th European Congress on Emergency Medicine 2010, Stockholm, Zweden. (poster presentation)	2010	
5th NVSHA Dutch North Sea Emergency Medicine Conference 2011, Egmond aan Zee, Nederland. (oral presentation)	2011	
9th NVSHA Dutch North Sea Emergency Medicine Conference 2015, Egmond aan Zee, Nederland. (poster presentation)	2015	0.25
11th NVSHA Dutch North Sea Emergency Medicine Conference 2018, Egmond aan Zee, Nederland. (poster presentation)	2018	0.25
39ste congres van de Nederlandse Vereniging voor Kindergeneeskunde, 2018, Papendal Arnhem, Nederland. (oral presentation)	2018	
12th NVSHA Dutch North Sea Emergency Medicine Conference 2019, Egmond aan Zee, Nederland. (oral presentation)	2019	0.5

2. Teaching		
	Year	**Workload (ECTS)**
General teaching activities		
Basis cursus Acute Zorg (BAZ) ErasmusMC (9 times)	2015-2016	2.25
Dutch Society of Emergency Physicians (DSEP): Toxicology course for residents (9 times)	2015-2020	6.75
Dutch Emergency Ultrasound Basis Course (7 times)	2015-2018	3.5
Dutch Emergency Ultrasound Pediatric (2 times)	2019	0.75
Dutch Emergency Ultrasound 'Scandag' (2 times)	2017-2019	0.5
Dutch Society of Emergency Physicians (DSEP): Disaster management course for residents (3 times)	2015-2017	1.25
Teaching Toxicology in the ED (ED-nurses)	2016	0.2
Teaching Emergency ultrasound (multiple times, residents emergency medicine and radiology)	2015-2020	0.5
Teaching acute exercise associated injury (multiple times, e.g. residents emergency medicine)	2015-2020	0.5
Development 'Trauma course' exam ED-nurses	2016	1.0
Supervising research Master students		
Maaike van den Hamer (2014)	2014	2.0
Bianca Buth (2016)	2016	2.0
Marieke Joosten (2016)	2016	2.0
Massoud Sadequi (2016)	2016	2.0
Nilab Hamidi (2017)	2017	2.0
Rianne Brand (2017)	2017	2.0
Marielle Vermaat (2017-2018)	2017-2018	2.0
Janine Hageman (2017-2018)	2017-2018	2.0
Josephine Jansen (2018)	2018	2.0
Siham Zabit (2018)	2018	2.0
Bibi Bosch (2018	2018	2.0
Tycho Los (2018)	2018	2.0
Leanne Brugts (2018-2019)	2018-2019	2.0
Alexandra Dubbeldam (2018-2019)	2018-2019	2.0
Linda Mos (2019)	2019	2.0
Jeanine Wols (2019-2020)	2019-2020	2.0
3. Other activities		
Researchmeeting Emergency Department	2015-2020	2.0
Total ECTS		**61.6**

IV. DANKWOORD

Het is zover, eindelijk is mijn proefschrift af! Mijn doel is bereikt, met de studies uit dit proefschrift hebben we hopelijk een steentje bijgedragen aan de verbetering van de patiëntenzorg. En zoals Lee Towers (normaal gesproken) in april altijd op de Coolsingel zingt: “You’ll never walk alone”, en geldt ook zeker voor schrijven van een proefschrift. Heel veel personen hebben direct of indirect bijgedragen aan dit proefschrift. Ik wil graag iedereen bedanken die een bijdrage heeft geleverd dit proefschrift.

Een aantal mensen wil ik hier graag expliciet noemen.

Graag wil ik alle patiënten bedanken die deel hebben genomen aan de verschillende studies uit dit proefschrift. Dankzij hun deelname kunnen we de patiëntenzorg een beetje verbeteren.

Daarnaast wil ik graag mijn co-promotoren dr. Pleunie Rood en dr. Juanita Haagsma en promotor prof.dr. Lex Burdorf bedanken.

Pleunie, als eerste dankjewel dat je me het plezier in onderzoek hebt terug gegeven. Jij durfde het aan om ‘die ANIOS’ een eigen project te geven en op afstand verder te begeleiden.
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