An Evaluation of Prehospital Epistaxis Treatment with Rapid Rhino

Version 2

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Abstract

Introduction
A new strategy of treating epistaxis patients has been implemented during 2015 in the region of Örebro County, Sweden. The strategy consisted of a delegation for ambulance paramedics to use Rapid Rhino to treat epistaxis patients in their homes during on-call time. By enabling the patients to safely remain at home and avoid a late-night emergency visit, this was also thought to reduce the workload of the emergency department. No evaluation of the results of this new strategy has been made since its implementation.

Aim
To evaluate the new strategy of prehospital treatment of epistaxis with Rapid Rhino regarding patient safety and the possibility to reduce the workload of the emergency departments.

Material and methods
Retrospective review of medical records in the Swedish region of Örebro County during the year of 2016. The search for medical records was based on the ICD-10 code for epistaxis (R04.0) and all patient visits during on-call time, defined as 4.30 p.m. to 7.30 a.m. in weekdays and all hours during weekends and holidays, were included.

Results
Two hundred thirty-one patient cases were included. In a total of 67 home visits, an attempt to treat epistaxis with Rapid Rhino was made in 36 of these visits and 22 patients could remain at home. No significant difference was found when comparing Rapid Rhino treatment results between treatment at home and hospital.

Conclusion
The strategy of prehospital epistaxis treatment provides a viable option for reducing the workload of the emergency department and does in this study not differ from treatment at hospital regarding patient safety.
Introduction

Epistaxis, defined as nasal bleeding, is a common problem, especially in the ear, nose and throat (ENT) departments. It constitutes for approximately 1 in 200 of total emergency department (ED) visits in the US [1]. It has been estimated to account for 33\% of all emergency ENT admissions albeit with a decreasing trend in the early 21\textsuperscript{st} century thought to be explained by new treatment options and more frequent outpatient management or immediate discharge [2]. The condition has been shown to be more common in the elderly [1–4] with the exception of an early peak in children below 10 years [1]. Male sex seems to be slightly more common in patients seeking medical care for epistaxis [1,3,4]. The condition has been shown to have a seasonal variation being more common during the winter [1–4].

The initial treatment of epistaxis consists of compression of the nostrils and a thorough review of the medical history. Effort should be made to differentiate between anterior or posterior epistaxis because anterior epistaxis could often be treated with chemical cautery or electrocautery. If the source of the bleeding could not be visualized or if cautery was unsuccessful, nasal packing could be the next choice of treatment where the use of a preformed nasal tampon is one type of packing [5–7]. Rapid Rhino (RR) (Smith & Nephew) (figure 1) is one type of preformed nasal tampon commercially available in different sizes. It is, after being soaked in water for at least 30 seconds, inserted along the floor of the nasal cavity and then expanded by inflation with air. It combines the advantages of a platelet aggregation-promoting surface and compression of the bleeding vessel in the nasal cavity. This makes it useful for treatment of both anterior and more posterior epistaxis [8]. RR has been shown to be equally effective in controlling the epistaxis as other types of nasal tampons but with lesser patient discomfort [9–11] and a greater ease of use for the health care worker [10,11].

The region of Örebro County in Sweden consists of three hospitals, were epistaxis patients are treated. In 2015, an agreement was made between the clinics treating epistaxis patients and the ambulance clinic in the region of Örebro County to implement a new strategy for the
treatment of epistaxis patients. Before the implementation of this strategy, all patients with epistaxis who received care in their home from an ambulance paramedic were transported to the ED of the nearest hospital. The new strategy’s purpose was, after the instruction of RR usage, to give the paramedics at the ambulance delegation to accomplish RR treatment of patients with epistaxis in their homes. Evaluation of medical history, basic vital parameters, topical application of an anaesthetic and decongestant spray together with digital compression of the nose was to be performed initially. If hemostasis was not achieved, a RR (size 7.5 cm) could be applied. If the RR succeeded in achieving hemostasis and the patient was stable, he or she could remain at home and information about the patient were given by calling the on-call ENT physician. The patients that were treated with RR and remained at home were given an appointment to the nearest ENT department on weekdays or to the ED on weekends for removal of the RR. The follow-up visit for removal was to take place in 24-36 hours from the insertion as per the instructions for Rapid Rhino usage given by the manufacturer. Before implementation of this strategy the paramedics were instructed, theoretically and in hands-on workshops, by ENT physicians on the usage of RR which has been shown to be easy to learn [8,9]. If the patient was unstable or not comfortable staying at home, he or she was to be taken to the ED for further treatment.

Aim
To evaluate the new strategy of prehospital treatment of epistaxis with Rapid Rhino regarding patient safety and the possibility to reduce the workload of the emergency departments.

Material and methods
The study sample was retrieved through a retrospective review of electronic medical records of patient visits that had been associated with the ICD-10 code for epistaxis (R04.0) during the full year of 2016. Inclusion criteria were unplanned emergency visit at a hospital or a visit at home by ambulance personnel during on-call time, defined as 4.30 p.m. to 7.30 a.m. in weekdays and all hours during weekends and holidays. Repeated visits were included if at least three days had passed after the last visit when hemostasis had been achieved. The study sample was retrieved from the region of Örebro County and its three hospitals (Örebro University hospital, Karlskoga General hospital and Lindesberg General hospital) by one reviewer and consisted only of anonymized data.

The data retrieved consisted of the following variables: gender, age, RR as the treatment of choice at a hospital visit or not, RR as the treatment of choice at a home visit (no, the patient
was directly transported to the hospital; yes, successful insertion of RR and the patient remained at home; yes, an attempt to insert RR, however unsuccessful at achieving hemostasis and the patient was transported to the hospital). If RR was the treatment of choice at home or at the hospital the following variables were also retrieved: adverse events, hemostasis at removal of the RR or not, further treatment received after removal or not, removal of the RR in 24-36 hours after insertion or not. The time of removal was noted when outside the interval. Patient safety was measured by these last four variables as these were seen as indicators of safety when comparing between treatment at home or at hospital in this study. Adverse events were defined as any type of injury to the patient that was directly related to the use of RR. Achieved hemostasis and further treatment received after removal of the RR was together seen as a measure of treatment effect. Data regarding removal of the RR within set time interval was retrieved for information on how well the guidelines for the treatment were followed by involved personnel.

For the evaluation of patient safety, the results from treatment at hospital were considered as a safety standard. For the comparison of success rates for RR insertion between treatment at home or at hospital, a successful insertion was defined as an insertion of RR that achieved hemostasis within the first 20 minutes while a non-successful insertion did not achieve hemostasis during equal amount of time.

Statistical analysis was performed with IBM SPSS statistics 23 software. Pearson’s chi-square test was used when comparing the variables related to when RR was the treatment of choice, except for when the variable cell count was <5 where Fischer’s exact test where used. A p-value of <0.05 was considered statistically significant.

This study was performed as a quality assurance program in the region of Örebro County. Informed consent was not gathered from the patients included. Retrieved patient data was anonymized and only handled by individuals involved in this study. Written consent to collect patient data from electronic medical records was given from the head of the medical departments concerned.

Results
Two hundred thirty-one cases met the inclusion criteria and were included in the study. Örebro University hospital received the majority with 184 patient cases compared to 39 cases at Karlskoga General hospital and 8 cases at Lindesberg General hospital. The median age was 68 years (interquartile range 46-79 years) and 42% were female. In a total of 67 home
visits, an attempt to treat epistaxis with RR was made in 36 (54%) of these visits. Twenty-two (61%) of these resulted in a successful RR treatment with achieved hemostasis and the patient could remain at home. Twenty one out of 23 (91%) patients received a successful treatment at hospital with achieved hemostasis which was a significantly higher rate compared to treatment at home ($p=0.015$).

No significant difference was found regarding treatment results comparing successful RR treatment at home or at hospital (table 1). A total of two cases received further treatment with chemical cautery despite having hemostasis at removal of the RR. Two adverse events related to RR treatment were recorded: one bleeding from an unknown synechia in the nasal mucosa and one other minor mucosal bleeding. Both received RR treatment at hospital. No adverse event related to an unsuccessful insertion attempt was recorded. The RR was removed outside the time interval of 24-36 hours in 22 cases (52% of total successful insertions) and 20 (91%) of these was a removal before 24 hours. Hemostasis was not achieved at removal in 12/20 (60%) cases where the RR was removed before 24 hours.

**Table 1.**
Comparison of Rapid Rhino treatment results.

<table>
<thead>
<tr>
<th></th>
<th>Successful treatment at Home (n=22)</th>
<th>Successful treatment at Hospital (n=21)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse events, n (%)</td>
<td>0 (0)</td>
<td>2 (10)</td>
<td>0.23</td>
</tr>
<tr>
<td>Hemostasis at removal, n (%)</td>
<td>13 (59)</td>
<td>10 (48)</td>
<td>0.45</td>
</tr>
<tr>
<td>Further treatment received&lt;sup&gt;a&lt;/sup&gt;, n (%)</td>
<td>11 (50)</td>
<td>11 (52)</td>
<td>0.88</td>
</tr>
<tr>
<td>Removal within 24-36h, n (%)</td>
<td>9&lt;sup&gt;b&lt;/sup&gt; (43)</td>
<td>11 (52)</td>
<td>0.53</td>
</tr>
</tbody>
</table>

<sup>a</sup> After removal of the RR.

<sup>b</sup> One missing value entry.

**Discussion**

The purpose of the new strategy implemented was to make treatment more convenient for the epistaxis patients and reduce the workload of the ED by treating epistaxis patients in their homes. The strategy of prehospital epistaxis treatment with RR reduced the workload of the ED with 22 patient cases during on-call time during the year of 2016.
In 46% of patient cases receiving a home visit, no treatment attempt with RR was made at home. According to the guidelines for the paramedics, only patients that are stable and in a condition to remain at home should receive RR and remain at home and it was probably the right call in these cases where RR was not used. The bleeding might have been profuse and the need for a stable treatment urgent, why referral to hospital was done instead of an attempt with RR. A feeling of insecurity due to lack of experience might also be a factor for promoting refrain. Further instructions on how to use RR and when to use it are desirable for promoting usage of this tool of treatment.

There was a significant difference in rate of successful insertions of the RR between treatment at home (61%) and hospital (91%). Other studies have in a hospital setting generated a success rate of 76% and 55% respectively where the latter one only included posterior epistaxis [8,9]. Posterior epistaxis is generally more complicated to treat but given its lower incidence of 5-10% of total epistaxis cases [6,12], it is unlikely that an uneven distribution of posterior epistaxis cases fully explains the difference between treatment at home or hospital. Even though the use of RR has been shown to be easy to learn [8,9], the procedure of filling the RR with air is still user-dependent and an important step in achieving hemostasis by compression of the nasal mucosa. Therefore, it cannot be excluded that a lack of experience could have an impact on the rate of successful insertions. Although the rate of successful insertions generated by treatment at home seems to be within the same range as the rates generated by other studies [8,9], the treatment at hospital showed an even higher rate of successful insertions. Possibly due to the physician at hospital inserting the RR could have performed other treatments without achieving full hemostasis before inserting the RR contributing to a synergistic effect.

The comparison between treatment at home and hospital regarding treatment results rendered no significant difference. This indicates that, if a successful insertion is achieved at home, the patient would receive a treatment which result is no different from the one given at hospital, but without the need of a hospital visit. Seeing that this strategy of prehospital treatment is new, no previous studies exists for comparison. These results indicate that the strategy of prehospital treatment seems to be a safe option.

Regarding the time interval for removal of RR, there was no significant difference between treatment at home and hospital but 52% of all cases with successful RR treatments had the RR removed outside of the time interval. The majority of these (91%) were removed earlier than 24 hours. Considering that 60% of removals before 24 hours had not achieved hemostasis, it
is likely that this could affect the RR’s ability to achieve hemostasis. The level of achieved hemostasis at removal in this study was 53% in total and it is possible that it could have been raised if the RR had been in place for at least 24 hours. After the implementation of this new strategy, the instructions regarding the time interval of RR has been changed by the manufacturer to 24-72 hours. This change could facilitate a situation where the RR is not scheduled for removal earlier than recommended providing a longer time-span were an appointment during daytime could be found. Considering this, a revision of the routines regarding the RR removal visits in general is needed.

Two cases received further treatment despite having achieved hemostasis at removal of the RR. After removal of the RR, the physician examines the nasal cavity to ensure that hemostasis is achieved, and in these cases prominent vessels were found. Therefore, the further treatments received in these cases can be considered as preventative measures.

The new strategy is expected to also affect the workload of the ambulance paramedics. Patients receiving treatment and remaining at home means fewer ambulance transports. This would allow the ambulance paramedics to proceed to the next case without the need of a transport to the hospital of the first patient. Due to the time spent on treating the patients in their home versus ambulance transport to hospital, it is expected that the benefits are greater when treating patients further from hospital. It is not known whether a short distance from the patient’s home to a hospital have influenced the decision to make a treatment attempt or not.

When considering the limitations of this study it should be noted that this study was not powered to detect small differences. The comparison of treatment results rendered no significant differences and it is possible that this was due to the small study size. Another limitation is the collection of the study sample that was based on the use of the ICD-10 code for epistaxis in medical records. That code is supposed to be used in every patient visit related to epistaxis. But, if coding of a patient visit was not performed, or the patient did not show up for removal of the RR after treatment at home, or the program used for the search based on this code is insufficient, patients that would have met the inclusion criteria might not have been included. Furthermore, patient safety was evaluated by comparing the results generated from treatment at hospital to the new strategy’s treatment at home. Therefore, this study did not measure a true value of safety, but rather a comparison to the traditional treatment at hospital that was here assumed to be safe. Another limitation is that the prevalence of anticoagulant therapy and its eventual effects on this study results is unknown. Anticoagulant
therapy have been shown to be a risk factor for epistaxis and patients receiving this therapy does often need greater interventions than other patients with epistaxis [13].

This study has shown that the strategy of prehospital treatment of epistaxis with RR has lowered the workload of the emergency department during 2016. This study also indicates that the prehospital treatment with RR does not differ from treatment at hospital regarding patient safety. Although, there is a need for a revision of the routines regarding visits for RR removal in general which could reduce the need for further treatment after removal of the RR. To offer additional training to the paramedics could be beneficial in gaining more experience in deciding when and how to use the RR, which eventually could lead to a higher rate of successful insertions. This strategy seems to be a viable option to treat epistaxis patients and could probably be applied more frequently in region of Örebro County and be considered in other regions of Sweden. Future studies with larger sample size would be favourable for more reliable results.

Conclusion

The strategy of prehospital epistaxis treatment provides a viable option for reducing the workload of the emergency department and does in this study not differ from treatment at hospital regarding patient safety.
References


Dear editor,

Please consider enclosed manuscript for publication.

This study has evaluated a new strategy of prehospital treatment of epistaxis in a region of Sweden. This strategy is the first in its field and therefore, no previous studies exist regarding its effects. We have shown that the strategy has lowered the workload of the emergency departments in the region where it was implemented. Furthermore, it has allowed the patients with epistaxis to be treated and remain at home during on-call time and thus avoid a stressful late-night emergency visit to the hospital. At the same time, the patient safety seems to be no different compared to similar treatment received at hospital. This study is an important first step to inspire larger studies of this strategy and to a potential implementation of the strategy in Sweden as a whole.

This study represents original work and has not been published elsewhere. All authors have approved the final version of the manuscript.

Yours sincerely

Gustaf Brandelius
Etisk reflektion

Denna studie är utförd i linje med vad som anses vara kvalitetsgranskning av verksamhet enligt 31§ HSL. Studiematerialet har inhämtats genom journalgranskning där endast en person har utfört granskningen. Materialet som extraherats ur journalanteckningarna bestod endast av aidentifierade uppgifter och kan därmed ej spåras till enskilda personer. De patienter vars journaler utgör materialet för studien har ej blivit delgivna information om dess existens och ej heller givits möjlighet att uttrycka medgivande. Denna studie var en retrospektiv journalgranskning vilket innebär att patienternas behandlingar redan var avslutade vid studiens start. Studien har därför inte haft inverkan på deras behandlingsresultat och ej heller utsatt patienterna för tidigare oprövade behandlingar som exempelvis vid studier för nya läkemedel.

Vid en journalgranskning utan uttryckt medgivande uppstår etiska problem. De involverade i studien bör alltid respektera patientens integritet vid hanteringen av känslig information och endast information relevant för studien bör samlas in för att minimera intrånget.

Näsblödningar är ett vanligt tillstånd och det finns även en risk för att det kan upprepa sig hos vissa individer. Patienterna inkluderade i studien har ej erhållit någon fördel i sin behandling men kan ha bidragit till en förbättrad vård av framtida episoder av näsblod, hos sig själva och hos andra.
Ny strategi för att behandla patienter med näsblödning utvärderad


Studien har utförts genom en journalgranskning av alla fall med näsblödningar under jourtid från 2016. Denna studie har funnit att den nya strategin har lett till en minskad arbetsbelastning för akutmottagningen samtidigt som patienter har fått möjligheten att vara kvar i hemmet under sena kvällar/nätter. Samtidigt har ingen skillnad i patientsäkerhet setts vid en jämförelse mellan behandling i hemmet och motsvarande behandling på sjukhus. Detta innebär att metoden är ett användbart komplement i vården av patienter med näsblödning och kan i framtiden vara aktuellt för övriga landsting i Sverige.