MOTIVATION OF PHYSICIANS TO RECOMMEND AN APP FOR A SERIOUS DISEASE TO PATIENTS

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MOTIVATION OF PHYSICIANS TO RECOMMEND AN APP FOR A SERIOUS DISEASE TO PATIENTS

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Abstract

The possibilities to use telehealth in the treatment of patients have dramatically increased due to digitalization of health care and the availability of suitable end devices. Most telehealth research focuses on patients or on organizations (like hospitals), while the behaviour of physicians is often neglected. In life-style issues and in cases of mild, temporary diseases, patients often consult just the Internet or friends. In case of serious and chronic diseases, this is not possible and physicians continue to play an important role in the treatment process. Specialised physicians diagnose, monitor, and treat such diseases. They can play two roles in such cases. First, they may influence the patient’s decision whether to use telehealth. Second, if the patients adopt the software, the physicians can further analyse the electronically available data with support of other parts of the software. In other words, they can reap further benefits from telehealth. This situation has barely been empirically analysed in information systems or healthcare research. Therefore, we develop a model to better understand the physicians‘ motivations to recommend the use of telehealth software to patients given his different roles.

Keywords: Telehealth, Physicians, Healthcare technology adoption, Chronic diseases, Apps.

1 Introduction

Telehealth is part of the broader e-health domain, which serves as an umbrella term for describing the use of modern information systems (IS) in the health care sector (Oh et al. 2005). Telehealth involves the use of communication technology to deliver health care outside of traditional health-care facilities (WHO 2018). Today, telehealth often encompasses the use of m-health technologies. M-health is defined as the subset of e-health delivering health information and services over a mobile platform (Akter 2012). The use of a smartphone app for medical purposes is a form of m-health. Telehealth is meant to support health care professionals as well as patients (Motamarri et al. 2014). It improves patient autonomy (Koch 2006), quality of life (Polisena et al. 2010) and may decrease mortality rates in chronic diseases (Darkins et al. 2008; Steventon et al. 2012). Moreover, telehealth seems to enable more effective prophylactic therapies, resulting in less emergency attendances and hospital admissions (Martín-Lesende et al. 2017; Polisena et al. 2010). Another notable effect is therapy adherence (Velardo et al. 2017). It is believed that telehealth technology needs to go beyond pure monitoring and should involve physician-patients interaction (Velardo et al. 2017).

In physician-patient interaction, health research is usually focused on the patient (Koch 2006). The increased availability of connected mobile devices facilitates the delivery of telehealth services (Rathbone and Prescott 2017). Today, most of these services are managed either by the patients themselves or by automated software. In a low-risk treatment this might be sufficient, but in cases of high-risk chronic diseases the participation of a physician is advantageous or needed. A physician’s recommendation of an app is central for patients’ potential adoption of the app. The involvement of a physician increases the confidence of patients because they feel professionally monitored allowing them to act more independently in the end (Velardo et al. 2017; Cox et al. 2017). A participating physician may, with the help of software, react quicker and prevent negative health incidents.
The physician’s involvement may be a decisive factor for the success of telehealth interventions (Greenhalgh and Shaw 2017). Telehealth use varies between diseases (Ringbæk et al. 2015), resulting in a fragmented set of studies. However, Wade et al. (2014) point out, that physicians’ acceptance is central to the adoption of telehealth and that physicians need to perceive the technology as effective to adopt it. Yet, with traditional health research being either patient-focused or describing the physician-patient relationship (e.g., Charles et al. (1999)), the motivation of physicians to recommend telehealth and get involved remains unclear (Hatz et al. 2017).

Since physicians are important for the diffusion of telehealth, we focus on the physicians’ motivation to recommend and use telehealth technology. In other words, we observe the adoption of telehealth that can go beyond telemonitoring. We develop, therefore, a model for the recommendation behaviour of physicians that includes their potential willingness to get involved with the product beyond patient functionalities. Bearing this in mind, our main research question can be simply stated as:

RQ: What motivates physicians to recommend telehealth software for treatment of a chronic disease and how strong is the influence of these motivations?

Next, we discuss previous research to further outline the relevance of our physician-focused study. Then, we describe the context of our study. This is followed by modelling and hypotheses development. Lastly, we discuss the design of the survey and provide a short summary.

2 Previous research

Psychometric research describing physicians’ motivation to recommend telehealth is sparse, but there are useful findings in related areas. The first related area is research on how physicians decide between prescribing similar drugs. This is similar to choosing between two treatment approaches, i.e., telehealth or traditional treatment. Early research includes work about the role of physicians in prescribing generic versus original drugs (Hellerstein 1998). The prescription behaviour showed an unexpected independency from patient characteristics, indicating that physicians simply tend to rely on their preferred treatment methods. This research has been continuously replicated for different drugs. The studies usually concluded that physicians’ preference for a treatment is the determining factor in their choice of a treatment, but they do not describe the formation of the preference. This holds true for early replication studies (Solomon et al. 2003) as well as for very recent ones (Anderson 2018).

The second related area is the adoption of m-health technology, especially amongst physicians. As previously stated, the physicians’ involvement may present a crucial part in successful telehealth applications. Telehealth adoption and health behaviour research are usually patient focused, while the physicians’ interaction with healthcare technologies has been usually viewed from an organizational point of view (Lluch 2011). This is confirmed by a recent review by Hatz et al. (2017), who point out that technology adoption within the healthcare sector is a complex issue influenced by the factors of innovation, environment, organization, and individual. They further stress the central role of the physician in healthcare technology adoption since he serves in multiple roles as initiator, supporter, and decision maker. Therefore, the physicians’ motivation to adopt telehealth is a crucial factor, but empirical analysis of what constitutes this motivation is lacking (Hatz et al. 2017; Wisdom et al. 2014). In consequence, reliable motivation measures are also missing (Wisdom et al. 2014). Note, that in telehealth scenarios, the physician may also take the additional role of a user.

Lastly, the research of clinical best practice implementation offers some insight into physicians’ behaviour. While the telehealth software itself represents a medical product, recommending it to a patient is similar to applying a new treatment. In this respect, the physician behaves like implementing a finding from medical research into clinical practice. In healthcare, the gap between evidence-based best practice and actual patient care presents an ongoing problem (McGlynn et al. 2003; Madon et al. 2007; Zardo and Collie 2014). This gap manifests itself in slow uptake or failure of new, research-based practices despite numerous, high quality evidence for its effectiveness (Appleby et al. 2016). Similar to the prescription behaviour outlined above, the physicians’ personal preferences are the only significant antecedents of research implementation (Squires et al. 2011). It has also been noted that the internal factors (e.g., motivation, attitude) require more analysis (Grimshaw et al. 2004). Consequent-
ly, several studies of physicians’ attitudes and beliefs related to best practices have been conducted (e.g. (Weng et al. 2013)). Appleby et al. (2016) provide a systematic review of the factors influencing physicians’ behaviour: peer pressure, practice habits, perceived usefulness, and perceived relevance are the main factors. In the case of the disease we observe (see below), telehealth presents an evidence- and research-based best practice that has already produced positive results (Mondorf et al. 2012).

To summarize, the importance of physicians in the implementation of telehealth has been identified. It has been established that external factors related to the physician (e.g., peer pressure) seem to be more important than factors related to the patient. The impact of internal factors like the physician’s altruism on his recommendation behaviour has not been analysed thoroughly yet.

3 Bleeding disorders

We focus our study on a chronic disease that requires patient self-management as well as patient-physician cooperation. These are bleeding disorders, which involve elaborate patient self-care in cooperation with individualized extensive support by the physician. According to the World Federation of Hemophilia (WFH), 295,866 people suffer from bleeding disorders globally. The most common bleeding disorder is haemophilia (62%). We focus on haemophilia since it is on the one hand a rare disease requiring individual care and therapy, but on the other hand prevalent enough to have sparked the development of several telehealth platforms. The disease and treatment situation is outlined next.

Blanchette et al. (2014) describe the disease as follows: Haemophilia means the missing of blood clotting factors VIII or IX (WFH, 2016). Clotting factors are needed to form blood clots and, in the case of external bleedings, scarf in order to stop bleedings and seal wounds. The danger of this disease seems obvious with external bleedings, but haemophiliacs are also prone to internal bleedings. Internal bleedings may occur in joints due to too much stress (e.g., rough landing after a jump) or, in extreme cases, even inside the brain. While bleedings inside the brain are rare, joint bleedings present a permanent threat to haemophiliacs, since multiple incidents result in joint-disabling arthropathy. The treatment of haemophiliacs is a replacement therapy, where the missing clotting factor is synthesized and provided in patient-individual timeframes as a transfusion (Blanchette et al. 2014). The right timeframes are crucial to the quality of the treatment and, therefore, the patients’ quality of life. They are also the factor that is most positively influenced by telehealth (Mondorf et al. 2012). The dosage regimen of the replacement factors is a topic of conflicting interest between insurances, physicians, and patients. This is due to two main reasons: On the one hand, replacement factors are very costly to synthesize. On the other hand, the factor cannot be over-dosed, but easily under-dosed. Therefore, physicians tend to prescribe more than needed to be on the safe side (Knobe and Berntorp 2012), but this can lead to high cost to insurances who cannot spend this money to fight other diseases.

The patients’ susceptibility to bleedings influences the timeframes, within which the replacement factor is provided and which determine the type of therapy. “On-demand” therapy only includes episodic provision of a replacement factor after a bleeding incident. This reduces replacement factor consumption and does not require much therapy adherence from the patient, but it allows an internal bleeding to take place before the patient recognizes it and reacts. Therefore, on-demand therapy, while cheaper and easier, at the first glance, presents a long term health risk (Blanchette et al., 2014). “Prophylactic” therapy means the regular intake of replacement factors independently from bleeding incidents. Prescription of prophylactic therapy depends on the severity and the number of bleeding incidents, which already occurred (Blanchette et al., 2014). Prophylactic therapy performs better in preventing bleeding incidents, but it is initially more costly and more demanding in terms of therapy adherence (Hoots and Nugent 2006). M-health software is particularly useful in supporting prophylactic therapy, since the therapy needs to be constantly adjusted to individual patient characteristics (Blanchette et al., 2014). After injection of replacement factor, patients differ in their factor degradation rate (pharmacokinetic) properties. The retention of the protection depends on the patient’s weight and other factors (Collins et al. 2010). Knowledge about the current factor level is decisive to haemophiliacs, since a higher level allows for joint-stressing activities like sports, whereas a low level demands less stressful activities.
M-health applications allow the patient to track his level and adjust his daily activities. The applications also allow to report time and location of bleeding incidents, allowing for telemonitoring and subsequent therapy adjustments by the physicians (Mondorf et al. 2012).

In most western countries, a treatment centre system paired with a central register has been established to distribute and monitor transfusions. Blood transfusions are handled separately from regular medicine due to the increased risk tied to them. Patients are, therefore, not using pharmacies but treatment centres, where they receive their tested medication and meet their responsible physician. Haemophilia apps supporting the treatment and providing telehealth options are treated as a medical product in most developed countries and, therefore, need to adhere to standards and tests (Schmoldt 2016). German physicians are required by law to report the factor consumption of their patients. Therefore, haemophilia apps in Germany are integrated into the IS of treatment centres, but their use is not mandated.

In a basic treatment setting, the patient uses the app to document his factor usage and bleeding incidents. The app transmits the data to the patient’s treatment centre (if the app is supported by the treatment centre). If the physician only uses the data during the patient’s next personal visit, it still qualifies as telehealth, since the data is still continuously transferred to the treatment centre. The physician may also opt to set certain thresholds and be alarmed in the case of incidents. Greenhalgh et al. (2017) call it “warm” telehealth, when the physician may intervene based on monitoring data. In a more advanced setting, the data submitted by patients can be automatically sent to the central registry. Another advanced use is a multi-patient analysis supported by the software through additional functions. Both haemophilia apps used in Germany, smart medication and Hameoassist, provide these features. Patients may use other software to record their consumption of factor concentrates or bleeding incidents but they are not supported by treatment centres. So, they need to submit a paper copy on their visit.

4 Research Model and Hypotheses Development

We have outlined above that there is only sparse research on the healthcare technology adoption behaviour by physicians and even less on which factors influence their recommendations, despite the critical role of the physician in patients’ choices as evidenced by research (e. g. Anderson 2018).

In IS and marketing literature, recommendations have been often explained through the lens of word of mouth (WOM) (East et al., 2005). In numerous studies, WOM has been shown to be a crucial factor in consumer choice, being perceived as more persuasive and trustworthy than traditional marketing, e. g. print or TV ads (Cheung & Thadani, 2012). With the rise of online shopping, WOM was extended to online platforms and further referred to as electronic word of mouth (eWOM). According to Cheung & Thadani (2012), it presents several unique features. First, the recommendations diffuse very fast and are easily scalable. Second, eWOM recommendations are more persistent and accessible, since ratings and posts stay available online. Third, it is easily measurable and provides a basis for analysis due to the volume of recommendations taking place in online sales. However, the credibility of the recommendation is unclear, since the receiver does not know the sender personally, like in traditional WOM.

To summarize, existing literature uses (e)WOM to describe recommendation behavior among consumers and it explains it by several motivators.

However, the relationship between a patient and his physician is different. It is more hierarchical, due to knowledge disparity, and more personal, due to individual appointments. In our case, patients and physicians use partly two different systems (documentation/monitoring), which depend on each other, but do not have the “same product” characteristic, which is typical in the consumer area. Finally, physicians usually do not have the time for extensive use of social media but meet peers a few times a year at special conferences. Therefore, eWOM models seem to be less promising for our situation than a thorough analysis of physicians’ motivations to recommend a treatment or an app, in our case. A good candidate towards this goal is general Self-Determination-Theory (SDT), which provides a tested frame of motivations and allows to include context-specific factors (Deci & Ryan 2000).

SDT positions any motivation within three fundamental psychological needs: autonomy, competence and relatedness (Deci and Ryan 2000). Autonomy encompasses the need to perceive oneself as an independent being not relying on external benevolence. Competence describes the desire to perceive
one’s own actions as effective and to feel skilful in carrying out these actions. Relatedness involves the need for belonging and affiliation to a social group. Satisfaction of those needs translates to different levels of motivational engagement. Motivation is distinguished into three types: Intrinsic, extrinsic and amotivation (Ryan and Deci 2000). Intrinsic motivation is present when an activity provides satisfaction by itself, while external motivation means an activity is pursued to achieve certain results. Amotivation occurs when an individual’s needs are dissatisfied and he is therefore less likely to pursue a given activity, e.g., when actions are not perceived as effective, self-controlled, or recognized within the social group.

As mentioned above, intrinsic motivation means satisfaction from performing the activity itself. In the context of our study, it reflects the satisfaction a physician receives when recommending an app, which he believes will improve the treatment and the patient’s quality of life. In a healthcare context, the satisfaction in helping others is complemented by the importance of the physician-patient relationship, as determined by McMurray et al. (1997). Pre-existing studies on physicians’ intrinsic motivation are rare (Franco et al. 2002). Malik et al. (2010) showed in a study researching physicians’ job satisfaction, that serving people is a frequent positive intrinsic influence of satisfaction. We therefore hypothesize:

**H1:** Perceived satisfaction from helping patients positively influences recommendation intention.

The prescriptions, interventions, and technologies a physician applies are largely dependent on external, extrinsic factors, such as their professional community (Appleby et al. 2016). This is mostly reflected by the SDT dimension of relatedness, which has been proven a crucial factor in any work environment (Deci et al. 2017). Gagnon et al. (2003) used the theory of interpersonal behaviour to describe telemedicine adoption by physicians, and concluded that social norms and responsibility within the physician community positively influence the intention to adopt a telemedicine technology. The impact of the physician’s peer group on his perceived relatedness and job satisfaction was also shown by McMurray et al. (1997), further establishing the importance of the physician’s peer group. This was also proven by an early network analysis by Burt (1973), showing that physicians with more and better connections were more educated, held a higher status, and were early adopters of new technologies. Moreover, a systematic review by Godin et al. (2008) analysed the factors influencing healthcare professionals’ behaviour and found social influences to be one of the most consistent predictors. Similar results were given by Malik et al. (2010), who found respect by peers to be a frequent socio-cultural determinant of physicians’ job satisfaction. In the context of our study, peer pressure is reflected by other physicians already recommending the app to their patients and reporting resulting treatment improvements to the community of physicians. Therefore,

**H2:** Perceived peer pressure positively influences recommendation intention.

A physician may also recommend telehealth software because he expects to improve his treatment effectiveness through its usage. This is different from inherent satisfaction in helping others because the emphasis is here on the positive outcome of his work (e.g., like the percentage of successful surgeries). Therefore, a technology might be recommended because the physician views it as his professional responsibility to apply a more effective intervention (Gagnon 2003). Physicians state a desire for a good professional experience as relevant for job satisfaction (Malik et al., 2010). In this part of our model, we assume that the physician views the advantages of telehealth as useful for himself (and the patient). For example, the physician expects a better adherence from the patient using an app for documentation which makes his job easier and makes him perform better. Another example may be the desire of the physician to monitor a high-risk patient more closely, which may be achieved by using an app. If any of these advantages are seen achievable with the new technology, the physician will more likely recommend an app to the patient.

**H3:** Expectations of improved work outcomes positively influence his recommendation intention.

Amotivation occurs when any of the three dimensions relatedness, autonomy, or competence is thwarted. Perceived decreasing autonomy, in this instance, is a factor the physician may fear for the patient. Usually, when analysing motivation, the three dimensions of SDT are applied to the individual in question, but autonomy in healthcare settings demands a different approach. Patient autonomy and
self-determination are constantly promoted in healthcare literature and also desirable for the physicians. Especially in chronic disease management, patient autonomy in treating the disease increases their quality of life and reduces the physicians’ workload. A physician may suspect that patients who feel they are constantly monitored will act less autonomous. For haemophiliacs, this could mean being less cautious, finally resulting in the need for more interventions by the physician.

H4: Perceived decreased patient autonomy negatively influences recommendation intention.

In SDT, amotivation also occurs if an action is deemed as not worth the effort (Ryan & Deci, 2000). In the context of our study, if a physician perceives telehealth use as ineffective, his need for effectiveness will be thwarted. This may be the case if a physician does not consider the app to provide any improvements to an ongoing treatment. Berliner (2014) pointed out, that a physician’s evaluation of a technology is also made in absence of actual medical evidence, which leads to a purely perception-based decision. A physician who considers an app to have no relevant effect on the treatment will not recommend it. Therefore:

H5: Perceived non-effectiveness negatively influences recommendation intention.

The use of the app for haemophilia documentation affords further functions and benefits beyond the treatment of an individual. Two important benefits are the possibility of reliable and easy multi-patient analyses and the automatic transmission of factor usage and incident figures to the central registry as mandated by the Transfusion Law. A physician may recommend to his patients the use of the app but he does not need to use these additional functions. The use by patients is a necessary but not a sufficient condition for use by physicians. In other words, he cannot use them if his patients are not using the app but he may not use them even if they do. There can be different reasons for such a behaviour, e.g., lack of time or knowledge about the app. We can consider the decision of the physician to use additional features as an adoption decision embedded in the above SDT model. His decision to recommend the app to a patient may be influenced by his intent to use the additional features. This can be considered another extrinsic motivation but we model it separately because of its complex structure.

We use the Value-based Adoption Model (VAM), developed by Kim et al. (2007) to model the intent of the physician to recommend app use based on his use of advanced functions. While originally developed to measure the adoption of the mobile internet, it was later also used in different contexts, e.g., the adoption of the Internet of Things (Hsu and Lin 2018). VAM is fundamentally based in the cost-benefit paradigm defined in the context of decision theory (Johnson and Payne 1985), where a product’s utility is determined by what it provides in contrast to what it demands. VAM defines this as benefits and sacrifices, where each consists of two sub-dimensions (Kim et al. 2007). Benefits are split into enjoyment and usefulness based on Cognitive Evaluation Theory (CET) (Deci and Ryan 1985). Sacrifices include technicality and fees. Technicality refers to the non-monetary costs of technology use like time and effort. Fees include monetary cost. Physicians incur both either through direct use of the app or the use by their personnel. Physicians are not reimbursed for that in the German system.

Following VAM, we consider recommendation intention to be based on benefit and sacrifice components. The first component of benefit is usefulness. Usefulness has proven to be a reliable antecedent in technology adoption models and is present in frequently used models like TAM and UTAUT. Usefulness is considered the utilitarian component of benefit and, following CET, also the extrinsic part. It is defined as the value a user perceives from using a new technology. In the context of VAM, usefulness also reflects the quality of a product. Here, usefulness solely relates to the value of the systems’ components as used and perceived by the physician. The advantages to the physician are as mentioned: He is able to monitor multiple patients, react in emergencies and has the patient data visualized instantly, and automatically report the concentrate usage as required by law. Perceived usefulness has also shown to be a valuable predictor in health care contexts (Holden and Karsh 2010).

H6: Perceived usefulness positively influences the adoption intention.

Perceived enjoyment reflects the hedonic and intrinsic component of the benefit aspect. In our study it relates to physicians who use telehealth software because they enjoy using it. Similar to usefulness, enjoyment is a reliable factor in predicting the value and adoption behaviour. It has proven to be a
significant predictor where general adoption theories were applied to healthcare contexts, but also in healthcare-specific models (Hatz 2017).

**H7:** Perceived enjoyment positively influences the adoption intention.

The sacrifice component contains monetary and non-monetary cost. Technicality represents the non-monetary costs. In the context of telehealth technology, several factors add to the non-monetary cost: First, the physician has to learn how to use the software, imposing a time cost on less intuitive software. Second, the physician needs time to use the software. If it is a monitoring software, he needs to check the provided data in regular intervals or, if the monitoring is automated, to reserve some time for reacting to possible alarms. Although the application of the software creates benefits switching to it (and perhaps using it) is often perceived as additional workload. This may be even more of an issue, since there is no reimbursement for supporting the telehealth software.

**H8:** Perceived technicality negatively influences the adoption intention.

In Germany, usage of the software usually also involves handling by care centres’ nurses. Their engagement constitutes opportunity cost for the physicians who are their employers or for a hospital. Out of pocket cost may be incurred for training (or other expenses for training outside of the office). Telecommunication, equipment, storage, and supply costs are negligible as physicians do not need any special equipment. Again, the lack of reimbursement may have a negative impact (Schmoldt 2016). Thus, the perceived “fees” will lessen the intention to adopt a telehealth technology.

**H9:** Perceived fees negatively influence the adoption intention.

Figure 1 shows our complete research model.

## 5 Survey Design and Summary

We will conduct a survey based on the given model in order to answer the research question. The relevant population consists of physicians who treat haemophilia in Germany. We have received the commitment of the council of physicians in the German Haemophilia Society (DHG) to distribute the survey among appr. 180 physicians who are members of the society (majority of German specialists for haemophilia). DHG is the biggest German association of haemophilia patients and open to physicians too. Given the relatively small population and the complex model, we will probably need to decrease the number of paths going into the recommendation intention for model evaluation. This simplification can be easily achieved by creating meaningful „summarizing“ constructs that are already indicated by dotted lines in Figure 1 (e.g., by creating the construct benefits that directly influences recommendation intention and that is formed by perceived usefulness and perceived enjoyment).

Control variables include age and care intensity. While age is rarely a determining factor for physician behaviour change (Godin et al. 2008), this might differ in the case of new technologies. We also introduce care intensity as a control variable, measured by the frequency of physician-patient interactions. Since telehealth allows to streamline interaction sessions, physicians with more frequent interactions may tend to prefer telehealth implementation to lessen their workload.

The motivation constructs will be operationalised with items chosen and adapted from Hatz et al. (2017) and Gagné et al. (2014). For VAM constructs, we will use items adapted from Hsu and Lin (2016). If validity, reliability, and model fit are acceptable, we will conduct the analysis with partial least squares structural equation modelling.

The evaluation of the model will help to better understand what motivates physicians (not) to recommend to patients the use of an app that helps to document and monitor a chronic disease. The theoretical understanding of their motivations has practical implications for physician and patient associations, health politicians, insurances, and other interested parties. If these parties consider the apps to be useful, they can better influence the physician’s recommendation behaviour (e.g., insurances could decrease the cost of the physician for additional work by offering a reimbursement since they profit from more economic use of replacement factors).
To conclude, we study motivations of physicians to recommend telehealth to patients. Previous research identified the necessity to investigate this. We study the issue observing the treatment of the chronic disease haemophilia. In this context, the use of the software by patients is a necessary but not a sufficient condition for use by physicians. We will apply the developed model to data gathered from haematologists.

\[\text{Figure 1: Research model for the intention to recommend a telehealth app}\]
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