

REGULAR ARTICLE

Web-based consultations for parents of children with atopic dermatitis: results of a randomized controlled trial

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Abstract

Aim: To analyse how web-based consultations for parents of children with atopic dermatitis affect self-management behaviour, health outcome, health resource use and family costs.

Methods: Ninety-eight children with atopic dermatitis were randomly assigned to intervention and control groups. The intervention group received remote dermatology consultations through a secure web-based communication system. The control group was encouraged to seek treatment through traditional means such as general practitioner visits and hospital care. Both groups received an extensive individual educational session prior to the intervention.

Results: Thirty-eight percent of the intervention group used web-based consultations 158 times ranging from 1 to 38 consultations per patient. We found no change in self-management behaviour, health outcome or costs. The intervention group tended to have fewer visits to practitioners offering complementary therapies than the control group, and we found a positive correlation between emergency visits at baseline and messages sent. Both groups, however, reduced the mean number of skin care treatments performed per week and had fewer total health care visits after the intervention.

Conclusion: We found no effect of supplementing traditional treatment for childhood dermatitis with web-based consultations. This study showed that web consultations is feasible, but more research is needed to determine its effect on self-management skills, health outcome and resource use.

INTRODUCTION

Using a secure web-based still-image system for counselling parents of children with atopic dermatitis (AD), during an eczema outbreak, may be an effective supplement to traditional AD treatment. Specialist advice based on digital photographs of the affected area together with explanatory text may be both educational and supportive. This is, to our knowledge, the first study evaluating web-based consultation as a supplement to traditional AD treatment for children.

Childhood AD is a common skin disease affecting up to a fifth of the school children in Western countries (1–3). The main feature of AD is itching, chronic course and resistance to treatment (4). AD may have a profoundly negative effect on the quality of life of the children causing sleep disturbances, tiredness, mood changes and impaired psychosocial functioning, and this may disrupt the entire family (5,6). The time to care for a child with AD has been estimated to range from 1.5 to 3 h/day with reduced parental employment as a result (7).

Previous studies have shown that parental education and training in the treatment of childhood AD had a positive clinical effect and improved the parents' quality of life (8–10). A study by Cork et al. (11) found that repeated demonstration and parental training reduced the seriousness of the eczema considerably.

The Internet is a promising channel for strengthening self-management skills, and the delivery of web-based interventions to patients is increasing rapidly (12). Researchers have reported that web-based education programmes for asthmatic children improved asthma knowledge, reduced the burden of the disease and realized cost savings (13,14).

This study describes a web-based consultation service for parents of children with AD. The parents are able to send digital photographs of the affected area, together with explanatory text and a form, to classify and rate the extent and severity of the eczema electronically and to consult a paediatric dermatologist for treatment advice. Such use of store-and-forward technology to combine medical advice and parental training may improve management skills, health outcomes for the children and cost effectiveness. The main aim of this article is to investigate how web-based consultations affect self-management, health outcomes, resource use and family costs.

METHODS

Participants and design

The current study was a randomized controlled trial (RCT) conducted at a secondary care hospital in Norway. The recruitment process began in May 2005 and continued until approximately 100 children with medium to severe AD had

been enrolled in the study. The recruitment process lasted for 15 months. A total of 131 parents were invited to participate during an ordinary outpatient consultation at the Paediatric and Dermatology clinics at the University Hospital in North Norway (UNN). Patients from a second clinic (Hammerfest Hospital) were included to increase the number of participants. Of these, 119 agreed to participate, of whom 21 did not return the consent form, leaving 98 children for randomization.

During the initial consultation, baseline questionnaires and consent forms were handed to the parents. As soon as these forms had been returned, the children were consecutively randomized into two groups, using the simple randomization method with shuffled envelopes (48 to the control group and 50 to the intervention group). The parents then received information in a letter about group allocation, and those in the intervention group received user names and passwords for the secure web-based communication system. Data were gathered through questionnaires at baseline and 12 months follow-up and through logging of messages.

Intervention

The intervention group was provided with software that enabled them to use a secure messaging system. All parents had Internet access from home, and during the study period, a digital camera was loaned to those in the intervention group who did not own one. This system allowed them to send photographs of the eczema area and a written description of the child's condition to the specialist. They were also encouraged to fill in a pre-designed form to classify and rate the extent and severity of the eczema. Based on this information, the specialist responded with treatment advice. There were no restrictions on the number of messages each family could send during the 1-year trial period.

The control group received standard treatment without such access to specialist care. They were encouraged to seek treatment through traditional means such as general practitioner (GP) visits and hospital care.

Procedure at the clinic

Both groups took part in a 30-min individual face-to-face educational session prior to the intervention, where knowledge of AD and self-management skills was strengthened. The participants were instructed in eczema-related skin care by a specialist nurse. Such extensive individual education is not part of the traditional treatment regimen at the clinic.

All the messages were reviewed and answered by one dermatology resident. Two nurses trained to handle AD stepped in if the resident was out of the office. The communication software was installed on four computers at the specialist hospital. One computer was situated at the paediatric outpatient clinic, two at the dermatologic outpatient clinic and one at the dermatologist's office. No automatic alert system existed, so one of the computers was checked daily for incoming messages. The system was based on patient-initiated contact, and the parents were informed that the specialist would respond in 24 h or during the next working day.

Technical solution

To ensure the privacy of the patients' online communication, a secure messaging system was used. This system enabled the patients to send photographs and text to their specialist using an ordinary web browser. To fulfil the security requirements for sending sensitive information over the Internet, the patients had to log in with a user name and a password over an encrypted connection. This also required a two-phased authentication, which was solved by sending a one-time password, valid for 10 min, to the patient's cell phone during the login process. The patients had to repeat this procedure for both sending messages and reading responses. This security procedure has been approved by the Norwegian Data Inspectorate.

Measures and data analyses

All messages were logged, and this was used to measure the use of web consultations during the trial period. Details of the time of diagnosis, family size and siblings with AD were reported in addition to traditional background characteristics (such as gender, age and education).

Self-management behaviour was measured using a form where the parents noted which kind of treatment they currently performed, such as moisturisers, emollients, baths, wet-wraps, antiseptics, topical steroids and phototherapy, and how often: daily, weekly or monthly.

The severity of the eczema was measured using objective or physician rated 'severity scoring of AD' (SCORAD) (15,16). This is a clinical tool for assessing the area of the affected skin, the severity of the eczematous skin and subjective symptoms such as itching and sleep disturbance. In the objective SCORAD (range 0–83), the patient reported symptoms are omitted so it reflects the physician's assessment only.

Self-reported numbers of GP visits, outpatient consultations, emergency visits, hospital admissions, visits to complementary therapists and personal expenses (for moisturisers, special clothing, diets, etc.) were used to assess whether web consultations affected resource use. The participants were asked to estimate the number of visits 1 year prior to the study and during the 12-month follow-up. Total health care visits were calculated by adding the number values of these self-reported visits. In addition, the parents' absence from work was measured to assess loss of employment at baseline and 1-year follow-up.

We used a practical approach to estimate the sample size. There is a limited available patient population to recruit from in our region, and after consulting with a senior paediatrician, we decided on a target of 100 patients as the maximum number we could possibly hope to include within a reasonable time period. If we had based our sample size on the same calculations as Staab et al. used in an article published in 2006 (10), we would, with our sample, have had enough power to find medium size differences between the study groups.

Baseline characteristics were compared using analysis of variance. We tested the normality of the data using the Kolmogorov–Smirnov test. For those variables not meeting

Table 1 Baseline variables in mean (95% CI) unless stated otherwise (n = 98)

Variables	Intervention	Control
Overall response rate post-intervention (%)	37 (74)	36 (75)
No. (%) of female children	26 (52)	28 (58)
Age in years children	4.6 (3.7–5.5)	5.3 (4.3–6.3)
Age in years parents*	32.9 (31.3–34.5)	35.8 (34.0–37.6)
No. (%) of female parents†	45 (90)	39 (81)
Years with AD	4 (3.1–4.9)	5.3 (3.1–7.6)
No. (%) of siblings with AD	1.48 (0.8)	1.37 (0.7)
No. (%) of with a college/university education	31 (62)	30 (63)
No. (%) of urban residency‡	10 (20)	22 (47)
SCORAD	22.3 (19.1–25.6)	22.3 (18.7–25.8)
Self-management	2.9 (2.6–3.3)	3.1 (2.7–3.5)
Total health care visits§	6.7 (5.3–8.1)	8.6 (6.0–11.2)
Private costs in € (2007 prices)§	341 (262–403)	446 (282–589)
Days' absence from work	2.9 (1.4–4.3)	3.0 (0.8–5.2)

*Significant difference at a 0.02 level.

†The parent filling out the questionnaire.

‡Significant difference at a 0.006 level.

§See text for more details.

the requirements for use of parametric tests, we used non-parametric analyses. Repeated-measures analysis of covariance was used to compare baseline and post-measurements with groups as the between-subject factor. Participants with missing data were excluded from the specific analyses. Baseline differences were entered into the analyses as covariates. All reported confidence intervals (CI) are 95%.

Ethics approval was granted by a regional ethics committee before any contact with the participants was made.

RESULTS

All participants (n = 98) returned the baseline questionnaire since this was a requirement for participation. Of these, 73 (74.5%) returned the postintervention questionnaire. There were no systematic differences in baseline characteristics between responders and non-responders. We found two significant differences in background variables between the intervention and control groups at baseline: parents' age and urban residency (Table 1). The parent filling out the questionnaire was younger in the intervention group (mean age 33 vs. 36, $F = 5.977$, $p = 0.02$). The intervention group also included significantly fewer urban residents than the control group. Two out of ten in the intervention group lived in urban areas compared to five out of ten in the control group ($F = 7.994$, $p = 0.006$).

Two out of five of the parents who had access to web-based consultations used it on at least one occasion. The total number of messages sent during the 1-year intervention period was 158, ranging from 1 to 38 messages per child (median = 3, mean = 8.3, standard deviation = 10.5, percentiles 2–11). Fifteen percent of the messages were answered by the trained nurses. Table 2 shows the frequency of

Table 2 Number of messages sent during the 1-year trial period (intervention group)

No. of messages	No. of patients
0	31
1–2	9
3–5	2
6–9	3
10–15	2
16–32	2
38	1

the messages. The messages were mainly specific questions about how to handle the eczema.

Those who used web consultations had more visits to their complementary therapist at baseline than non-users (mean visits 1.47 for users vs. 0.21 for non-users, $\sigma = 0.394$, $p < 0.001$). We also found that the number of emergency visits at baseline was positively correlated with the number of messages sent ($\sigma = 0.459$, $p = 0.048$).

Seventy-nine percent (15 out of 19) of the users would recommend it to other parents of children with AD.

Self-management behaviour

The mean number of skin care treatments per week performed by the parents decreased from baseline to 1-year follow-up, for both groups (from mean = 3.1 to 2.2, $F_{(1,70)} = 31.1$, $p < 0.001$). No significant interaction with the groups was found ($F_{(1,65)} = 0.50$, $p = 0.48$).

Health outcome

We found no significant improvement in physician rated SCORAD from pre- to postintervention (mean 21.6–19.9, $F_{(1,69)} = 1.25$, $p = 0.27$), nor an interaction with the groups ($F_{(1,63)} = 0.359$, $p = 0.55$).

Resource use

Both groups had fewer overall health care visits after the 1-year intervention compared to baseline measurements (mean visits 7.1 vs. 2.9, $F_{(1,70)} = 39.5$, $p = 0.000$), except for hospital admissions ($F_{(1,69)} = 3.93$, $p = 0.052$). Family costs ($F_{(1,53)} = 0.05$, $p = 0.82$) and loss of employment ($F_{(1,52)} = 0.018$, $p = 0.89$) were not reduced from pre- to post-intervention. Analysis of the web counselling service showed no significant differences in resource use ($F_{(1,65)} = 0.216$, $p = 0.64$), family costs ($F_{(1,48)} = 0.114$, $p = 0.74$) or loss of employment ($F_{(1,49)} = 0.579$, $p = 0.45$). The only effect (not significant at a 0.05-alfa level) was that the intervention group tended to have fewer visits to their complementary therapist than the control group (mean difference 0.8 vs. 0.09, $F_{(1,66)} = 2.96$, $p = 0.09$).

DISCUSSION

Our study evaluated web-based consultations as part of AD-treatment in a secondary care setting. We analysed how web consultations affected self-management behaviour, health outcome, health resource use and family costs. We only

found a tendency towards fewer visits to alternative health providers. Parents in both the intervention and the control groups performed fewer treatments per week after the intervention, and they reduced their total visits to health care providers, except for hospital admissions, which remained constant. Fewer treatments per week could imply better self-management skills and improved symptoms, which may have resulted in a decreased demand for GP visits and hospital care.

One explanation for these results may be that the individual educational session provided to both groups prior to the intervention, was effective in strengthening the parents' skills in handling their child's eczema. This positive effect of parental education corresponds with other studies in the literature (10,17). Other reasons may be that the intervention period was too short to demonstrate potential benefits of web counselling, but a more likely explanation is the limited use of the system. Only eight parents used the service more than five times during the 1-year trial period. This corresponds to previous research showing low adherence in web-based interventions (18,19). Low use and high drop-out rates may underestimate the effect of such interventions.

The somewhat random nature of AD could be one of the reasons for the low use. The need for counselling and support will vary according to whether the child has an acute period or not. The general basic need for education and contact with specialist health services was probably met for both the intervention and the control groups in this trial.

It is, however, also possible that the web consultations alone is ineffective in strengthening self-management skills, improving symptoms and reducing costs. This article contributes with a detailed description of a web-based consultation service that is feasible and may have the potential to ease some of the burden of caring for a child with AD. Further research is, however, needed to determine whether such counselling alone actually reduces the costs and improves health outcomes for the children.

Both the individual educational session and web consultations may increase trust and confidence in traditional medicine and increase adherence to recommended treatments. Carroll et al. discussed in their paper that a perceived lack of support from medical professionals can lead to less trust in traditional medicine and decreased adherence to treatment and suboptimal outcomes (3). Lack of confidence in traditional medicine and lack of knowledge about AD treatment have also lead to overuse of health resources including alternative therapies (10). Those parents who used web consultations had more visits to complementary therapists prior to the intervention, and this may reflect mistrust in traditional medicine. We also found a positive correlation between emergency visits at baseline and messages sent, implying that web consultation seems more popular among those with serious AD.

Four out of five users would recommend web consultations to other parents of children with AD, implying a high degree of satisfaction with the service.

Preservation of privacy and confidentiality, when exchanging medical information and images over the Inter-

net, is an important issue in Norway. This online service has fulfilled the security requirements by using user names and passwords. This may have caused login trouble and may partly explain the low use of the service. One out of three users reported some kind of technical difficulties.

We have assumed that the quality of the digital images transmitted over the Internet is satisfactory for diagnostic and management purposes. Previous research has shown that use of still images in teledermatology is safe and produces similar clinical outcomes, when compared with conventional clinic-based consultations (20,21).

Our study has several limitations. First and foremost is our modest sample size. We do not have adequate statistical power to reject the null hypothesis and conclude that web consultations have no effect on health outcome and resource use. We cannot discount the possibility of relationships between use and other variables. Second is the lack of inter-rater reliability in the estimated SCORAD. Third, all study participants had Internet access, and they were recruited at outpatient clinics, implying both a bias towards technology acceptance and a higher frequency of health care visits than children with AD in general. Finally, since the data on resource use are self-reported, some respondents might have miscalculated visits to GPs, phone consultations, hospital consultations and admissions and family expenses, potentially biasing our results.

This study should be regarded as an initial exploration of complementing traditional AD treatment with web-based programmes to support the parents' in coping with their child's condition. A combination of counselling and training via the Internet may increase adherence to treatment and improve medical, psychological and economic outcomes. An open channel directly to specialist care may also provide a 'feeling of security' and be of value to the parents even though they use the service less frequently.

CONCLUSION

Overall, no effect of the intervention was found. Supplementing traditional treatment for childhood AD with web-based consultations is feasible. We found a correlation between emergency visits at baseline and messages sent, implying that web consultations seem more popular among those with serious AD. More research, however, is needed to determine its effect on self-management skills, health outcome and resource use.

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