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Original Investigation

Effectiveness of an Online Knowledge Training and Assessment Program for Stop Smoking Practitioners

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Abstract

Introduction: In English National Health Service (NHS) stop smoking services, stop smoking practitioners (SSPs) provide behavioral support and medication to support smokers wanting to quit. This study aimed to evaluate an evidence-based national online knowledge training program for SSPs developed by the NHS Centre for Smoking Cessation and Training (NCSCT).

Methods: Knowledge required to deliver effective stop smoking interventions was assessed using 25 multiple-choice questions drawn randomly from a common larger pool at baseline and after use of the training program in 778 consecutive users. Change in knowledge and association of this change with time spent on the training were assessed. Baseline and change in knowledge of SSPs with different amounts of experience, prior training, and time dedicated to smoking cessation were compared.

Results: Knowledge improved from 64.4% correct to 77.7% ($p < .001$). Time spent on the training predicted improvement. Pretraining knowledge scores differed with experience, prior training, and time practicing. Training improved even the highest performing SSPs and minimized differences between groups.

Conclusions: Knowledge required to deliver effective stop smoking intervention is improved efficiently by using the NCSCT online training program for English smoking cessation practitioners. SSPs with all levels of prior knowledge benefit.

Introduction

With the introduction of the National Health Service (NHS) stop smoking services (SSSs) in 1999, England was the first country to set up a countrywide system of local cessation services with complete coverage of the population. There is a SSS in each primary care trust (151 administrative areas in England responsible for the delivery of health care); the service is paid for by taxation and free at the point of access. The SSS is one of the best-value life-preserving clinical interventions of the NHS (National Institute for Clinical Excellence, 2007). Treatment offered is a combination of medication and behavioral support, which have been shown to increase smokers' chances of success both in randomized controlled trials and routine clinical practice (Brose et al., 2011; Cahill, Stead, & Lancaster, 2008; Hughes, Stead, & Lancaster, 2007; Lancaster & Stead, 2005; Stead & Lancaster, 2005; Stead, Perera, Bullen, Mant, & Lancaster, 2008). To support best practice across services, evidence-based guidelines for the provision of services (West, McNeill, & Raw, 2000) and training of those working as stop smoking practitioners (SSPs) were developed (Health Development Agency, 2003).

However, success rates across services vary considerably (Brose et al., 2011; NHS Information Centre, 2010). In 2009/2010, over 700,000 smokers set a quit date with an SSS in England; across services, 31%–70% ($M = 49\%$) reported 4 weeks after the quit date that they had been abstinent for at least 2 weeks. Biochemically verified abstinence (low carbon monoxide concentration in expired air) at this point ranged from 3% to 58% across SSS with an average of 34% (Department of Health, 2011; NHS Information Centre, 2010).

There are several possible reasons for this variation in success rates across services. Each administrative area of England funds and organizes its local SSS, which leads to variation in practice. Data recording and biochemical verification practice may vary, and client characteristics will differ. Crucially, treatment (medication and behavioral support) provided also varies between services (NHS Centre for Smoking Cessation and Training [NCSCT], 2009; NHS Information Centre, 2010). Although standards for training and delivery existed, these were not mandatory, and practice has drifted away from initial guidance (Bauld, Coleman, Adams, Pound, & Ferguson, 2005). In addition, there are no minimal

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entry requirements to work as SSP, and practitioners have a wide range of professional backgrounds, including nursing, pharmacy, and administration. Specialist or "core" practitioners are usually employed directly by the SSS specifically to deliver stop smoking interventions, while community practitioners deliver them for the SSS but as part of or in addition to their main role, for example, as pharmacist, nurse, or midwife. Since training for practitioners has been provided mostly in-house by each SSS (NCSCT, 2009), it is likely that there is a wide variation in the extent and content of training. Differing backgrounds and varied training lead to variation in practitioners' competences in terms of providing the most effective medication and evidence-based behavior change techniques for stop smoking interventions. A smoker's chances of successfully quitting therefore vary considerably depending on the local SSS accessed and the individual practitioner seen.

A coordinated approach was needed to ensure high quality content of behavioral and pharmacological support across services. In 2009, the Department of Health in the UK commissioned the NCSCT to (a) identify the competences required to deliver, manage, and commission smoking cessation support in England; (b) develop and implement methods of assessment to ensure that SSPs, managers, and commissioners possess these competences; and (c) commission and provide training and continuing support to allow staff to achieve the required level of competence.

Evidence-based competences required to deliver behavioral support for smoking cessation have been identified from guidance documents and randomized controlled trials (Michie, Churchill, & West, 2011), and a number of these competences have been shown to be associated with short-term success rates of SSSs (Michie et al., 2011; West, Evans, & Michie, 2011; West, Walia, Hyder, Shahab, & Michie, 2010).

Informed by this work, a national training program has been developed to train knowledge-based and skills-based competences necessary to provide effective behavioral support. Knowledge-based competences are trained through an online training and assessment program (www.ncsct.co.uk). Using text and videos, it addresses smoking in the population, smoking and health, why people smoke and find it hard to stop, the process of how smokers manage to stop, effective ways to help people stop smoking, medication use, and how to plan and deliver a behavioral support program. Training of skills-based competences for behavioral support is delivered in the form of two-day face-to-face training courses in groups of 20–30 practitioners. The face-to-face training will be evaluated elsewhere.

The Department of Health now recommends that all SSPs working for the NHS receive training that conforms to the training standards and competences set by the NCSCT (Department of Health, 2011).

After registration, at the beginning of the online knowledge training and assessment program, a training needs analysis assesses baseline knowledge, and helps the trainees direct their subsequent training. At a point of their own choosing, trainees take a formal assessment to assess posttraining knowledge. Both assessments consist of 25 multiple-choice questions, drawn randomly from a common pool containing twice the number of questions as needed. Results are presented as percentages of correct answers. The pass rate for the formal assessment is 70%; there is no pass criterion for the baseline assessment. There is no time limit for the completion of questions, and it is possible to go back to a previous question. Failure to give an answer is treated the same as an incorrect answer.

The aims of the present study were to evaluate the knowledge assessment, which is part of the online training and to assess the impact of the online training and assessment on practitioners' knowledge. It addressed the following questions:

1. What is the construct validity of the NCSCT's assessment as a test of knowledge?
   After completing the baseline and the online formal assessment for the first time, a subsample of SSPs completed an additional knowledge assessment, which required short free-text answers in response to open-ended questions. It was expected that knowledge produced in response to these questions was associated with scores in the first formal assessment. It was also expected that baseline knowledge scores were positively associated with length of working as SSP, previous smoking cessation training, and larger part of the job dedicated to smoking cessation. The last aspect broadly reflects the difference between "core" SSPs who spent all or most of their time on smoking cessation and "community" SSPs who spent a small part of their time on smoking cessation.

2. Does knowledge improve as a result of the NCSCT online knowledge training?
   The training was expected to improve SSPs' knowledge required to deliver effective stop smoking interventions. This would be reflected in higher scores in the first formal assessment than at baseline.

3. Does the training reduce differences between subgroups of SSPs?
   The expected differences in baseline knowledge between SSPs with different duration of working as SSP, previous training, and part of the job dedicated to smoking cessation were expected to be reduced in the first formal assessment.

4. What are the associations between baseline knowledge, time spent on the training, and improvement in knowledge?
   A higher baseline score was expected to predict less use of the training program, in particular those who scored at least 70% at baseline (equivalent to a pass in the formal assessment) were expected to make less use of the training program than those who scored lower. Improvement in knowledge scores was expected to be associated with the time spent using the training between the two assessments. It was also expected that those who went from taking the baseline assessment to taking the formal assessment without use of the training would improve less than those who made use of the training.

Methods

Participants

SSPs working in the United Kingdom who had completed the NCSCT's baseline and formal assessment between September 10, 2010, and April 18, 2011, formed the sample. When registering for the training program, SSPs provide some information about their demographic and professional characteristics, including how long they have been working as SSP, the amount of

training previously received and what part of the job is dedicated to smoking cessation.

Knowledge Assessments: Baseline and Formal Assessment (posttraining)

In both assessments, 25 questions assess knowledge in six sections that reflect the sections of the training program. Knowledge on smoking in the population is assessed by three questions about prevalence of smoking, of cessation attempts, and of smoking in different demographic groups. Smoking and health is covered by three questions on fatal and nonfatal diseases associated with smoking, smoking in pregnancy, environmental smoke, and benefits of smoking cessation. Two questions about why people smoke and find it hard to stop address mechanisms underlying nicotine dependence. Two questions address the process of stopping smoking: what happens before a quit attempt as well as shortly after quitting and later on in the process. Ten questions ask about effective ways to help people stop smoking; these cover guidelines and effectiveness of behavioral support; medications; approaches lacking evidence, which should be avoided; biomarkers for smoking; and how smoking cessation fits into the wider picture of public health and tobacco control strategies. Five questions assess knowledge on practical aspects of planning and delivering a stop smoking intervention. For both assessments, questions are randomly selected from the same pool of questions to ensure comparability of the two assessments; for each section, this pool contained twice the number of questions as needed. For analyses, trainees with an overall score of 0% were excluded, as these were assumed to originate from trainees not starting the assessment when confronted with the first question.

Additional Knowledge Assessment to Test Construct Validity of the Formal Assessment

An additional knowledge assessment with open-ended questions was conducted with a subgroup of trainees to examine the construct validity of the formal assessment. Trainees who had recently (successfully or unsuccessfully) completed the formal assessment were invited by email to complete online 20 knowledge questions requiring short free-text responses. These questions were developed by the NCSCT and covered smoking and health, effective stop smoking medication, effective techniques of behavioral support and delivery of a behavioral support program. Trainees received £25 shopping vouchers for completion of these additional questions. Responses were recorded online and transferred into an excel sheet. Based on a document with the correct content of answers and maximum scores for each question, two markers independently scored the responses. The two marks were averaged for each question and summed to provide a total score.

Analysis

Descriptive statistics were used to describe the sample and assessment scores.

Chi-square statistics and *t* tests were used to examine any differences between SSPs who had completed both assessments and those who had not (yet) completed the formal assessment.

Level of significance was set to $p < .05$ for all analyses.

Construct Validity of the NCSCT's Assessment

Scores for the free-text responses and the first formal assessment were correlated to estimate the extent to which both assessments measured the same construct. No further analyses of the free-text responses or the subsample that completed them were conducted. Analyses of variance were used to assess differences in knowledge at baseline across groups with different amount of time working as SSP, previous training, and different proportion of the job dedicated to smoking cessation.

Improvement in Knowledge During Training

Mean percentages correct in the baseline and first formal assessment overall scores and section scores were compared using paired *t* tests.

Reduction of Knowledge Differences in Subgroups of SSPs

Repeated measures analyses of variance were used with length of working as SSP, prior training, and part of the job dedicated to smoking cessation, respectively, used as between-subject variables.

Associations Between Baseline Knowledge, Time Spent on the Training, and Change in Knowledge

Four trainees, who had spent over 15 hr on the training, thus exceeding the *M* by more than four *SD*s, were omitted from these analyses. Correlations were used to assess whether the baseline score predicted the time spent on the training. Additionally, *t* tests were used to compare the time spent on the training for those who scored 70% or higher at baseline and those who scored lower. The association between time spent on the training and improvement in knowledge scores was examined using regressions; linear, cubic, and quadratic trends were compared to assess best fit. An additional linear regression of time spent on the training on change in knowledge scores was run adjusting for the baseline score. Improvement from baseline to first formal assessment in those who used the training for at least 5 min and those who used it for less than that was compared using repeated measures analyses of variance with time as between-subject variable.

Results

Figure 1 shows the selection of the sample. The majority of the sample was female ($n = 641$, 82.4%) and provided stop smoking interventions for the NHS ($n = 744$, 95.6%). SSPs worked for 112 different primary care trusts; at that time, England had 151 such trusts to provide and commission health care. In terms of length of working as SSP and previous training, chi-square statistics indicated no significant differences between SSPs who completed the formal assessment and SSPs who did not. SSPs for whom smoking cessation was a small part of their job were less likely to have completed the formal assessment than those who had their entire job dedicated to smoking cessation ($\chi^2(2) = 11.32$, $p = .004$). Those who completed the formal assessment also scored higher at baseline ($M = 64.06$, $SD = 15.11$) than those who did not complete the formal assessment ($M = 59.40$, $SD = 15.64$, $t(1,253) = -5.21$, $p < .001$).

In the first formal assessment attempt, 194 SSPs (24.9%) scored less than the pass mark of 70%; 156 (80.4% of 194) of them retook the assessment within the period captured, of which 110 (70.5% of 156, 56.7% of 194) achieved a pass in the second attempt.

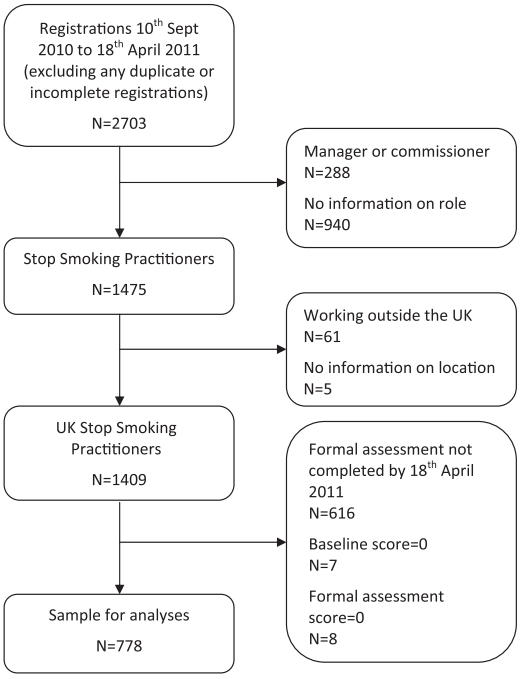

Figure 1. Sample selection.

Table 1. Comparison of Mean Knowledge Scores at Baseline and First Formal Assessment, Paired *t* Tests, *n* = 778

	M (*SD*) percentage correct					
	Baseline	Formal assessment	*t*	*df*	*p* Value	*r*[a]
Overall score	64.40 (14.48)	77.68 (14.16)	−24.95	777	<.001	.67
Subsections						
Smoking in population	58.45 (28.99)	76.21 (26.72)	−14.13	777	<.001	.45
Smoking and health	59.30 (28.91)	77.26 (27.04)	−13.57	776	<.001	.44
Why hard to stop	70.53 (32.31)	82.24 (27.57)	−8.64	776	<.001	.30
Process of stopping	53.99 (32.26)	64.67 (29.33)	−7.71	776	<.001	.27
Effective help	66.60 (19.20)	78.31 (16.75)	−16.40	776	<.001	.51
Plan and deliver help	68.06 (21.98)	80.85 (20.43)	−14.51	776	<.001	.46

Note. [a]Effect size, $r = .10$ is a small effect, $r = .30$ a medium effect, and $r = .50$ a large effect (Field, 2005).

Validity of the NCSCT's Assessment

The invitation to complete the additional free-text survey was sent to 195 SSPs. The survey was closed when a sufficient sample size of just over 100 respondents was reached; this sample size provided more than 0.9 power to detect a medium effect (Clark-Carter, 1997). A response rate cannot be calculated as additional SSPs might have completed the survey had it still been open. Two respondents were excluded, as the wording of their responses was nearly identical and completed at the same time, suggesting that responses were not independent. The remaining 101 respondents achieved a mean score of 42.57 ($SD = 7.05$) of a possible maximum of 72; scores ranged from 24.5 to 59.0. Correlation between scores for the free-text responses and first formal assessment scores was $r = .60$; $r = .63$ (both $p < .001$) if the trainee with the largest residual was excluded.

Improvement in Knowledge During Training

The overall score and all subsection scores improved significantly from baseline to first formal assessment. Effect sizes were moderate to large, with the exception of a slightly smaller change in the subsection about the process of stopping smoking, which also had the lowest mean percentage correct at baseline (Table 1).

Reduction of Knowledge Differences in Subgroups of SSPs

As expected, knowledge at the beginning of the NCSCT online training was associated with the length of working as SSP, prior training, and time dedicated to smoking cessation; all subgroups' knowledge improved after the training and gaps in knowledge decreased (Table 2). In detail, baseline scores were associated with the length of working as SSP ($F(2, 771) = 9.13$, $p < .001$); those with less than one year experience scored lower than those with longer experience. The assessment scores of SSPs with any level of experience improved significantly ($F(1, 771) = 593.76$, $p < .001$). In addition, a significant interaction of assessment score and length of experience as SSP ($F(2, 771) = 3.68$, $p = .03$) confirmed a significant narrowing between groups. Knowledge at the beginning of the training was associated with duration of previous training ($F(3, 764) = 17.92$, $p < .000$); all differences between groups were significant with the exception of the difference between no training and less than one day of training. Knowledge scores improved irrespective of the length of previous training ($F(1, 764) = 262.37$, $p < .001$), and the difference between groups was reduced at the end of the training as indicated by a significant interaction ($F(3, 764) = 7.13$, $p < .001$). Baseline scores differed between groups with different proportions of their job dedicated to smoking cessation ($F(2, 768) = 44.98$, $p < .001$). Those for whom it was only a small part of the job scored lower than those for whom it was a main part or the entire job (both $p < .001$). Knowledge scores improved for all groups ($F(1, 768) = 580.05$, $p < .001$), and the interaction of assessment and part of the job was significant ($F(2, 768) = 13.21$, $p < .001$).

Associations Between Time Spent on the Training, Initial Knowledge, and Change in Knowledge

Between completion of baseline and first formal assessment, the training program was used for an average of 145 min and 40 s (median 93 min, 31 s), with a wide variation ($SD = 172$ min). The time spent on the program significantly predicted the change in the overall assessment score ($r = .27$, $p < .001$). The correlation remained significant when adjusting for baseline score ($r = .22$, $p < .001$). A quadratic trend provided the best fit. The curve indicated that after spending 441 min (7 hr 21 min) on the training, any additional time would not increase benefit.

Higher baseline scores predicted, with a small coefficient, less time spent on the training ($r = -.16$, $p < .001$), and those

Table 2. Baseline Knowledge and First Formal Assessment Scores in Different Subgroups of 778 SSPs

			M (*SD*) percentage correct	
		N (%)	Baseline	Formal assessment
Working as SSP	<1 year	151 (19.5)	60.24 (14.45)	76.40 (14.52)
	1–3 years	287 (36.9)	64.54 (14.11)	76.98 (14.23)
	>3 years	336 (43.2)	66.23 (14.43)	78.83 (13.88)
	Missing	4 (0.5)	–	–
Duration of previous training	No training	20 (2.6)	53.00 (13.67)	74.00 (18.74)
	<1 day	51 (6.6)	55.06 (15.99)	73.80 (14.91)
	1–3 days	271 (34.8)	63.10 (13.66)	77.52 (14.66)
	>3 days	426 (54.8)	67.07 (13.98)	78.43 (13.47)
	Missing	10 (1.3)	–	–
Part of the job dedicated to smoking cessation	Small part	252 (32.4)	57.83 (14.21)	74.65 (15.89)
	Main part	143 (18.4)	66.24 (13.53)	79.72 (12.31)
	All of it	376 (48.3)	68.20 (13.35)	78.93 (13.34)
	Missing	7 (0.9)	–	–
Time spent on NCSCT training between baseline and first formal assessment	<5 min	127 (16.3)	64.94 (16.33)	73.48 (14.48)
	≥5 min	603 (77.5)	64.37 (14.00)	79.17 (13.56)
	Missing	48 (6.2)	–	–

Note. NCSCT = the NHS Centre for Smoking Cessation and Training; SSPs = stop smoking practitioners.

who achieved at least 70% at baseline spent significantly less time on the training (*M* (*SD*) = 103.70 (126.1) min) than those who scored less than 70% (*M* (*SD*) = 157.69 (168.2) min; $t(644.72) = -4.87$, $p < .001$).

The mean baseline score did not differ between those who used the training for less than 5 min and those who used it for at least 5 min ($t(167.14) = -0.30$, $p = .76$), and improvement from baseline to first formal assessment was significant regardless of group ($F(1, 724) = 269.55$, $p < .001$). As expected, there was a significant interaction between group and improvement such that the improvement for those who spent at least 5 min on the training was significantly larger than for those who spent less time on the training ($F(1, 724) = 19.04$, $p < .001$).

Discussion

The NCSCT online training substantially increased knowledge of smoking cessation and how to assist with it. Time spent on the training was associated positively with improvement in knowledge scores; however, returns disappeared after spending about seven hr on the training. Even those who spent no or very little time on the training in between the baseline and the posttraining knowledge assessment improved significantly. This suggests that taking the assessment in itself leads to an improvement. However, taking the assessment may have also led to increased awareness of opportunities to improve knowledge outside of the training program. This study did not include a control group of practitioners who took the assessments without access to the NCSCT online training, so the extent of improvement triggered by the assessments alone cannot be determined. Even though it is not possible to fully determine the "active ingredients" of the training and assessment program, there can be reasonable confidence that the improvement in practitioners' knowledge and the reduction in differences between groups of practitioners are due to the use of the training and assessment program.

The present analyses were limited to U.K. SSPs who had completed the formal assessment. In terms of length on the job or previous training, they did not differ significantly from SSPs who accessed the training program without completing the assessment, so there can be reasonable confidence that the present results are generalizable to the wider population of practitioners. They were, however, more likely to be core SSPs and scored higher in the baseline knowledge assessment, indicating that the present sample is slightly more knowledgeable than would be expected from the population of SSPs in England as a whole. It also indicates that community SSPs may need more encouragement to complete the training.

The construct validity of the standard knowledge assessment using multiple-choice questions was supported. Scores on multiple-choice assessment correlated significantly with a large coefficient with scores achieved by a subsample of SSPs on additional free-text responses, and the correlation coefficient was slightly higher than that found with other professional multiple-choice examinations (Hettiaratchi, 1978). A possible limitation is that some trainees may have verified responses to questions while taking an assessment, which would affect the internal validity of the assessments. However, reduced control of the completion situation was accepted, as the aim was to assess the effect of the training and assessment program on practitioners using it within their day-to-day job.

Associations with professional experience and previous training indicated validity of the assessment and effectiveness of the training. The online knowledge training improved SSPs' knowledge significantly and reduced differences between SSPs with different levels of previous training and length of working

as SSP, providing evidence of its effectiveness for SSPs with a wide range of level of prior knowledge.

The possibility exists that knowledge assessed here does not necessarily relate to success rates in helping smokers to stop smoking. Improving success rates is ultimately the aim of the training of SSPs. Therefore, further validation using information on the number of clients and success rates is now being sought using a revised version of the training program and external data on success rates to examine association with knowledge before training. The NCSCT training is anticipated to help bring success rates of SSPs and SSSs up to the standard of the best, which will be examined once there has been opportunity to register any changes in success rates since the uptake of the program. Future research aiming to replicate the present findings in more tightly controlled experimental or quasi-experimental studies would further support the validity and usefulness of the training and assessment program.

Conclusions

SSPs providing support to smokers wishing to stop smoking can improve their knowledge-based professional competences by using the NCSCT online training and assessment program, irrespective of the level of prior knowledge, training, or experience. Further validation using success rates is being sought. A positive impact of increased knowledge on success rates in helping clients to stop is anticipated.

The training meets the standard required by the Department of Health, which also recommends that SSPs should attain NCSCT certification. Special modules for smokers with mental health issues and pregnant smokers are under development.

The training and assessment program is not limited to those contracted to the English NHS but open to all practitioners in the United Kingdom and abroad; in addition, specific versions are being set up for groups such as practitioners working with pregnant smokers and smokers with mental health problems.

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Ethical approval

No ethical approval required (UCL, UCLH, and Royal Free Biomedical Research Unit, November 5, 2010).

Declaration of Interests

LSB and JAMK are employed by the National Health Service Centre for Smoking Cessation and Training (NCSCT). RW undertakes research and consultancy for companies that develop and manufacture smoking cessation medications (Pfizer, J&J, McNeil, GSK, Nabi, Novartis, and Sanofi-Aventis). He also has a share of a patent for a novel nicotine delivery device and is a trustee of QUIT, a charity that provides stop smoking support.

RW and SM are codirectors of the NCSCT. AMcE is director of the NCSCT. He has received travel funding, honoraria and consultancy payments from manufacturers of smoking cessation products (Pfizer, GSK, and Novartis). He also receives payment for providing training to smoking cessation specialists, receives royalties from books on smoking cessation and has a share in a patent of a nicotine delivery device.

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