

The effects of different kinds of user fee on prescribing costs in rural Nepal

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Objectives: (1) To estimate the cost of irrational prescribing, and (2) to compare the effect of three different kinds of user fee on prescribing costs, in rural Nepal.

Methods: A controlled before-after study was conducted in 33 government primary health care facilities in rural eastern Nepal during 1992–95. A fee per prescription (covering all drugs in whatever amounts) was regarded as the control against which two types of fee per drug item (covering a full course of treatment for each item) were compared. The average total cost to the patient for two drug items was the same in all fee systems. Total cost, expected cost (according to standard treatment guidelines) and wastage costs (total minus expected cost) per prescription were calculated from an average of 400 prescribing episodes per facility per year. The proportion of prescriptions conforming to standard treatment guidelines was calculated from 30 prescriptions per facility per year.

Results: 20–52% of total drug costs were due to inappropriate drug prescription. A fee per drug item, as compared with a fee per prescription, was associated with (1) significantly fewer drug items prescribed per patient, (2) significantly lower drug costs per prescription, (3) significantly lower wastage due to inappropriate drug prescription, and (4) a significantly greater proportion of prescriptions conforming to standard treatment guidelines. Average drug cost per prescription (which was 24–33 Nepali rupees [NRs] across districts and time) was 5.7 NRs (95% confidence interval 1.0 to 10.4) and 9.3 NRs (95% confidence interval 4.8 to 13.8) less with the two different item fees, respectively, than with the fee per prescription.

Conclusion: The economic consequences of irrational prescribing are severe, particularly in association with charging a fee per prescription. Item fees in the public sector reduce irrational prescribing and associated costs.

Introduction

Insufficient financing of public health services to meet either professionally defined patient need or patient demand has become more acute in low income countries over the last decade.¹ Many countries cannot yet provide basic primary health care for much of the population.² Despite these constraints, irrational drug use causes a serious waste of resources,^{3,4} which no country can afford. It has been suggested that if all these wastages were stopped, there would be enough funds to buy drugs for everyone's health needs.³

One solution to resource constraints is to impose user fees. However, a review of the economic literature⁵ concerning the effects of user fees in developing countries suggests that effects may be equivocal, and specifically that:

(1) fees will usually raise revenue but only in small amounts and at the expense of equity;

(2) fee collection is often inefficient due to administrative incapacity and lack of leadership;

(3) demand often remains low despite low prices, which may reflect poor quality service (rarely measured) and therefore an unwillingness to pay for such services.

Whilst many studies have focused on the efficiency of user fees at raising revenue or on their adverse effects on equity, few have evaluated the cost of irrational prescribing or investigated the effects of different kinds of user fee on prescribing costs. Two studies that did examine prescribing costs in association with different user fees compared fees of different level rather than type. Thus, increased cost sharing has been shown to be associated with decreased prescription of drugs, and hence drug costs, and decreased patient visits both in the USA⁶ and in Zimbabwe.⁷ However, studies that examine fees of varying level cannot exclude the effects of inequity upon the prescribing costs. Lower prescribing costs, due to patients' inability to afford adequate treatment, do not represent greater efficiency.

It has been suggested that some types of user fee (e.g. a single fee per prescription) may encourage over-prescription, so resulting in increased drug wastage that counteracts the benefit of the extra funds raised by the user fees.³ Other types of user fee (e.g. a fee per drug item) may discourage over-prescription and so be more cost-efficient.¹ This article describes the first controlled intervention study to estimate the costs of rational and irrational prescription in association with different kinds of user fee priced at similarly low levels. By keeping overall cost to the patient constant, the confounding effects of changing equity were excluded and the efficiency of different kinds of user fee were assessed in terms of prescribing costs.

This study builds upon other work, which used cross-sectional survey design and looked at similar outcomes in the same region of Nepal and under the same NGO. One study compared drug use in a district where there was a supplementary drug supply and a small prescription fee versus a district without any supplementary drug supply or fee.⁸ The other study compared drug use in three health facilities charging a fee per prescription versus three health facilities charging a fee per drug item and where the fee per item was cheaper for the average patient who received two drug items.⁹

Context

There are few countries poorer than Nepal, where there are few roads and much of the population is without electricity, sanitation or reasonable access to drinking water. Most people are engaged in agriculture; the Gross National Product (GNP) in 1991 was US\$180.¹⁰ The health of the population is poor. In 1991 life expectancy was only 53 years and the infant mortality rate was 101 per 1000 live births.¹⁰ Health care is undermined by a lack of human resources and essential drugs.¹¹

The study took place in areas supplied by drug schemes operated by the Britain Nepal Medical Trust (BNMT), an international non-governmental organization (NGO). BNMT,

together with the government, operated drug schemes in the form of subsidized locally revolving drug funds in the hilly and mountainous areas of Eastern Nepal. The aims of these drug schemes were to ensure adequate availability of essential drugs and to develop sustainable drug re-supply systems in public health facilities. Within these schemes, about half the drugs were supplied by the government and half by BNMT, and the patients paid about 25% of the total drug costs through user fees. Only drugs belonging to the essential drug list of Nepal¹² were supplied and there were few other sources of drugs in the rural areas where these schemes operated.

Aims of the study

The study's objectives were (1) to estimate the cost of irrational prescribing at government health facilities in Nepal, and (2) to compare the effects of three different kinds of user fee (at similar below-cost-price level) on the cost of rational and irrational prescribing at government health facilities.

Methods

A controlled before-after non-randomized study comparing three different types of user fee in 1992 and 1995 was conducted. Three districts used the same fee per prescription in 1992. In 1995 one district continued to charge a fee per prescription, while the other two districts charged a one-band or two-band fee per drug item as shown in Table 1. The new item fees were introduced during 1993–94 and there was an interval of 6–12 months between data collection before and after the new fee systems were implemented.

Implementation of the different user fees throughout the districts was done by BNMT and government district staff over a period of some months and included:

- a preparatory visit to each health facility to ensure an adequate supply of drugs and related materials at the start of the fee changeover;

Table 1. Details of the user fees for drugs in the three districts

Fee type	Districts where fees were implemented		Fee details ^a (£1 = NRs.70–80/- during 1992–95)
	1992	1995	
Fee per prescription	Panchthar Taplejung Bhojpur	Panchthar	NRs.5/- (health post) and NRs.6/- (hospital) per prescription, covering all drugs for a full course of treatment. The fee in Panchthar during the period 1994–5 was increased to NRs.7/- (health post) and NRs.8/- (hospital) per prescription due to inflation and in order to better match the other fees in overall amount charged per prescription.
1-Band item fee	–	Taplejung	NRs.3/- per item (health post) and NRs.5/- per item (hospital), whether cheap or expensive and covering a full course of treatment.
2-Band item fee	–	Bhojpur	NR.5/- per expensive item (e.g. antibiotics and injections) and NRs.2/- per cheap item (e.g. oral rehydration salts, vitamins, paracetamol, anti-helminthics), in both health post and hospital, covering a full course of treatment.

^a The average total fee per prescription in 1995, for each kind of user fee, amounted in total to approximately the same amount (about NRs.7/-), based on the average prescription having two drugs, one 'expensive' and one 'cheap'. NRs.7/- is equivalent to about one-third of the average day's cash income previously reported in one study to be NRs.23/- for 73% of village households.²³

- a limited publicity campaign of 3 months within the district, involving posters and talks in schools and bazaars on market days;
- a 2-day training seminar for health post staff;
- a visit by the NGO staff to the health facility to implement the new fee system and support the health workers during the first few days of charging the new fee.

In addition, there was a second part to the study, consisting of a cross-sectional survey done in 1995–6. In this survey, exiting patients (15–30 per facility) and health workers (1–5 per facility) were interviewed in order to observe the drugs received and the fees paid by patients, and also to ascertain patient and health worker characteristics. This cross-sectional survey is described elsewhere^{13,14} and was done to:

- check whether the prescribed drugs were dispensed;
- check whether the patients paid the fees they were supposed to pay;
- examine variation in patient and health worker characteristics between facilities which could confound the results.

The three districts were similar in terms of population, health services and ecological factors, and in each district there were 9–11 health posts and one district hospital. There was at least 5 hours walk between different health facilities either within the same district or between two contiguous districts, so reducing the chances of cross-contamination between facilities charging different kinds of user fee.

Average prescribing costs were assessed from a random systematic sample of, on average, 400 carbon copy prescriptions per facility per year (held initially in an Epi Info 6.03 database). These prescriptions in 1992 and 1995 were costed, using SPSS/PC+ (version 5) software, by linking the prescription database with:

- (1) a drug price database, using 1995 wholesale prices, in order to estimate actual cost per prescription;
- (2) a diagnosis cost database, calculated from standard treatment guidelines and 1995 wholesale drug prices, in order to estimate expected cost per prescription.

Average costs (actual and expected) per prescription for each facility were calculated and entered into a summary health facility database along with other indicators collected from health facility records or by observation.

Three potential problems with regard to costing diagnoses were dealt with as follows. First, it was assumed that the profile of disease severity, which could not be evaluated from the prescription, would be similar before and after the fees were introduced. Secondly, a set of rules was devised and applied by the main author for categorizing recorded symptoms and diagnoses that did not match those specified in the standard treatment guidelines into diagnoses that did match. For example, a sore throat without fever or lymphadenopathy was classified as a 'viral upper respiratory infection'. Thirdly, direct standardization for case-mix was carried out, assuming that the distribution of recorded and unrecorded diagnoses was similar, in order to prevent prescriptions for

which no diagnoses were recorded being calculated as having zero cost.

Other data from 1992 and 1995 in the health facility summary database included:

- (1) average cost per patient of drugs dispensed (as opposed to prescribed) according to health facility records (total drugs dispensed according to the dispensing register divided by the number of patients receiving prescriptions);
- (2) average number of drug items per prescription from carbon copy prescriptions;
- (3) average number of units per drug item prescribed from carbon copy prescriptions;
- (4) a quality of prescribing indicator, namely the percentage of prescriptions conforming to standard treatment guidelines, calculated from a random sample of 30 carbon copy prescriptions per facility per year; this indicator was found to be reliable (see footnote d, Table 2) and valid, since parallel changes occurred in other quality of prescribing indicators;^{13,14}
- (5) other potential confounding variables^{13,14} including:
 - patient age, sex and case-mix, from the carbon copy prescriptions;
 - patient attendance and staff availability from health facility records;
 - drug availability from regular observation at the health facilities by BNMT staff;
 - health worker refresher training and supervision from interviews.^{13,14}

Analysis

Multiple linear regression (Stata version 5) was used to analyze summary data at the level of the health facility, thereby accounting for the likelihood of greater similarity of prescribing within facilities than between them.¹⁵ The prescription fee district was regarded as the 'baseline' against which the prescribing costs in the two item fee districts in 1995, adjusted for 1992, were compared, i.e. the differences in prescribing costs across districts in 1995 were compared, taking into account the varying baseline levels in 1992. Expected and actual costs per prescription and, consequently, wastage due to irrational prescribing (actual – expected costs) were adjusted for varying case-mix by direct standardization (see footnote a, Table 2).

Multiple linear regression was also used to investigate the effect of potential confounding variables (see above). Variables were added, one at a time, to the regression model that included indicator variables for the two districts (fee systems) and the baseline level of the outcome. Confounding by other variables was judged to have occurred if, after insertion of the potential confounder, the estimates for the relative differences between the item fees and the prescription fee (B coefficients) changed by more than one standard error. No significant confounding was identified by this process. Models which included potential confounding variables are described in full elsewhere.¹⁴

Table 2. Mean values for prescribing costs in Nepali Rupees (NRs) and selected prescribing indicators in 1992 and 1995

Prescription (Px) indicators	Flat fee per prescription Panchthar			1-band item fee Taplejung			2-band item fee Bhojpur		
	1992 ^e	1995	change	1992 ^e	1995	change	1992 ^e	1995	change
Prescribing drug cost indicators									
Average actual drug cost per prescription (NRs) ^a	24.3	33.0	+8.7	27.7	28.0	+0.3	25.6	24.0	-1.6
Average expected drug cost per prescription (NRs) ^a	17.8	16.0	-1.8	19.4	16.7	-2.7	20.1	19.1	-1.0
Average wastage per prescription (NRs) ^{a,b}	6.5	17.0	+10.5	8.3	11.3	+3.0	5.5	4.9	-0.6
Wastage as a % of actual cost per prescription	27%	52%	+25%	30%	40%	+10%	21%	20%	-1%
Average cost per patient of drugs dispensed (NRs) ^c	22.1	31.1	+9.0	23.9	22.6	-1.3	22.8	26.3	+3.5
Prescribing indicators									
Average number of diagnoses per prescription	1.5	1.5	0.0	1.5	1.4	-0.1	1.4	1.6	+0.2
Average number of drug items per prescription ^a	2.9	2.9	0.0	2.9	2.0	-0.9	2.8	2.2	-0.6
Number of units per drug item prescribed	11.4	13.0	+1.6	13.0	15.7	+2.7	11.6	14.4	+2.8
% Pxs conforming to standard treatment guidelines ^d	23.5	26.3	+2.7	31.5	45.0	+13.5	31.2	47.7	+16.5

^a Indicators were standardized for case-mix using a standard population based upon the average case-mix across districts in 1995. Ten diagnostic categories used in the standardization by case-mix were - diarrhoeal, respiratory, skin, worms, accident, eye, genito-urinary, gastro-intestinal, symptomatic and other (including all other diagnostic categories).

^b Wastage = actual cost - expected cost.

^c Dispensed drug costs differed from carbon copy prescription drug costs in two ways. Firstly, dispensed drug costs were calculated using 1992 prices for 1992 and 1995 prices for 1995, since these data were collected as part of an audit process not primarily for this research. The difference in cost per prescription using 1992 instead of 1995 prices was investigated by costing all the 1992 records in the carbon copy prescription database using 1992 prices instead of 1995 ones and estimating the difference. It was found that using 1992 instead of 1995 prices resulted in each prescription costing on average NRs.1.8/- to NRs.2.2/- less. Secondly, dispensed drug costs included dressings and bandages, which constituted 4.5-6.4% of the total cost of drugs in each district.

^d The author judged whether the prescriptions conformed to Nepali standard treatment guidelines^{24,25,26} according to (1) the appropriateness of the drugs for the diagnoses, (2) dosage, (3) contraindications and (4) drug interactions. All prescriptions from one district in one year were examined once prior to the final 'judging' in order to develop a consistent set of rules and following 'judging' the prescriptions from five health facilities were re-examined in order to examine intra-rater reliability. The differences between the two sets of results found in the five health facilities were 0, +3.4 and -6.7% for the Bhojpur facilities, -2.5% for the Panchthar facility and +3.3% for the Taplejung facility.

^e Outcome variables in 1992 were not significantly different across districts, thus showing that the three districts were indeed comparable at the start of the study. Greatest variation occurred with regard to the % of prescriptions conforming to standard treatment guidelines. However, calculation of 95% confidence intervals for this variable showed that in 1992, 19-28% prescriptions conformed to standard treatment guidelines in the prescription fee district, 26-37% conformed in the 1-band item fee district, and 27-35% conformed in 2-band item fee district.

Results

Table 2 shows simple means for the various prescribing costs and the dispensing costs in 1992 and 1995, and the changes between 1992 and 1995. Table 3 shows the regression coefficients (representing the differences in outcome in 1995, taking into account 1992 levels) of the 1- and 2-band item fee districts, with the fee per prescription district as the 'control'. There was no substantive confounding in any regression model.¹⁴

Tables 2 and 3 show that average total costs per prescription and average wastage (actual minus expected) costs per prescription due to irrational prescribing were significantly lower in 1995 in the item fee districts than in the prescription fee district. The lower costs in the item fee districts, compared with the prescription fee district, were due to fewer drug items per prescription, without adverse effects on prescribing quality, as indicated by the percentage of prescriptions conforming to standard treatment guidelines.^{13,14} Indeed, the regression coefficients in Table 3 indicate that prescribing quality

improved by 12% or more in the item fee districts relative to the prescription fee district.

The lower relative costs in the item fee districts were as expected. However, contrary to expectation, absolute savings were not realised. Thus, the observed change in the average cost per prescription in Nepali rupees (NRs), over 1992-95, in the flat prescription fee district was +8.7 as compared with +0.3 in the 1-band item fee district and -1.6 in the 2-band item fee district. This counter-intuitive result probably arose because of a similar increase across all districts in the number of units of each drug prescribed, the reason for this being unknown.

Table 2 also shows that irrational prescribing accounted for a large proportion of the cost per prescription. Wastage per prescription (due to irrational prescribing), as a percentage of total drug prescription costs, in the prescription fee, 1-band and 2-band item fee districts was 27, 30 and 21%, respectively in 1992, and 52, 40 and 20%, respectively in 1995. Thus, between 1992 and 1995, the proportion of prescription costs

Table 3. Regression models^a for prescribing costs and selected prescribing indicators

Prescription (Px) indicators	1-band item fee Taplejung			2-band item fee Bhojpur		
	B	95% CI	p	B	95% CI	p
Prescribing drug cost indicators						
Average actual drug cost per prescription (NRs) ^b	-5.7	-10.5 to -1.0	<0.025	-9.3	-13.8 to -4.8	<0.001
Average wastage per prescription (NRs) ^b	-6.3	-12.1 to -0.5	<0.05	-11.8	-17.4 to -6.1	<0.001
Average cost per patient of drugs dispensed (NRs)	-9.2	-13.5 to -5.0	<0.001	-5.1	-9.2 to -1.0	<0.025
Prescribing indicators						
Number of drug items per prescription (Px) ^b	-0.89	-1.14 to -0.64	<0.001	-0.66	-0.90 to -0.41	<0.001
Number of units per drug item prescribed	1.5	-0.8 to +3.8	ns	1.3	-0.8 to +3.4	ns
% Pxs conforming to standard treatment guidelines	12.0	+3.0 to +21.0	<0.025	14.9	+6.2 to +23.7	<0.005

B = regression coefficient; CI = confidence interval; ns = not significant.

^a (Prescribing cost 1995) = constant + b_1 (prescribing cost 1992) + b_2 (1-band item fee) + b_3 (2-band item fee) + residual error.

^b Standardized for case-mix.

wasted due to irrational prescribing increased by 25% in the prescription fee district and 10% in the 1-band item fee district but decreased by 1% in the 2-band item fee district.

Validity of the results

Verification, across all districts, that patients were (1) charged the correct user fee,^{13,14} and (2) dispensed 81–88% of prescribed drugs,¹⁴ is described elsewhere. Validity of the cost results is supported by the fact that similar findings were found from two data sources, the carbon copy prescriptions and the dispensing registers (see footnote c, Table 2), with regard to:

- (1) the level of average drug costs per patient (Table 2); and
- (2) the significantly lower average drug costs per patient in the item fee districts as compared with the prescription fee district (Table 3).

Discussion

The results show, firstly, that 20–52% of drug costs were wasted through irrational prescribing and, secondly, that the item fees were associated with significantly lower prescribing costs and wastage as compared with the prescription fee. This second finding is demonstrated by the *relative* differences in prescribing costs between districts in 1995, adjusting for baseline values in 1992, i.e. the regression coefficients for the 1- and 2-band item fees. These relative differences between districts in 1995 are the most valid estimates of the effects of the item fees on prescribing quality and costs, compared with the prescription fee. This is the strength of the controlled before–after study design, which controls for secular trends over time, the cause of which cannot be confidently known.¹⁶ The apparent worsening of prescribing costs in the prescription fee district between 1992 and 1995 is one such secular trend, and does not detract from the conclusion that item fees result in lower prescribing costs and wastage compared with the prescription fee. In this study, the secular trend affecting

prescribing costs probably arose from a similar increase across all districts in the number of units per drug item prescribed.

There appeared to be few differences of effect between the 1- and 2-band item fees in this study. However, there was some evidence that the higher fee for ‘expensive’ items, such as antibiotics and injections, in the 2-band item fee area resulted in lower prescription costs as compared with the 1-band item fee area. This was probably due to a greater decrease in the use of ‘expensive’ drugs such as antibiotics and injections with the 2-band item fee as compared with the 1-band item fee.^{13,14}

Calculation of the expected costs was dependent upon the diagnoses recorded and, without adjustment, a prescription with an absent diagnosis would have been priced as having zero cost. Thus poor record keeping, or different practices for recording diagnoses, could have led to different estimates of the expected cost per prescription even though the case-mix would not have justified such differences in reality. This may have accounted for the slight reduction in expected prescription costs observed across all districts during 1992–5. However, direct standardization according to case-mix adjusted not only for variation in case-mix, but also for expected costs of those prescriptions where no diagnosis was recorded. The assumption was that where no diagnoses at all were recorded, the distribution of the unrecorded diagnoses was the same as for those prescriptions where at least one diagnosis was recorded. This may not have been so; for example, if only patients with more complex or more trivial problems had no diagnosis recorded on the prescription. However, since non-recording only occurred, on average, in 0.6–7.2% of cases across health facilities (evenly spread across districts), the potential for bias was small.

Although direct standardization adjusted for non-recording of diagnoses, it did not fully adjust for differences in the number of diagnoses recorded per prescription. However, the average number of diagnoses per prescription, and the average expected costs per prescription, were very similar

across districts and between 1992 and 1995. Furthermore, confounding by the change in the number of diagnoses recorded per prescription, between 1992 and 1995, did not occur.¹⁴

The lower prescribing costs in the item fee districts as compared with the prescription fee district were achieved through a reduction in the numbers of drug items per prescription and an improvement in prescribing quality, measured by the proportion of prescriptions which conformed to standard treatment guidelines.^{13,14} This is in contrast to the findings of the Rand Health Insurance experiment in the USA, where the decreased annual prescribing costs that occurred with increased cost sharing were not associated with improved prescribing quality^{6,17} because a decrease in both unnecessary and necessary antibiotic use was observed. However, the fees in our study were set at the same relatively low level in all districts. It may be that, if the fees in this study had been set as high (relative to patient income) as in the Rand Health Insurance experiment, reductions in prescribing costs would have been at the expense of prescribing quality.

There is a great deal of evidence that prescribing in the private sector, which charges per drug item, is more costly and of poorer quality.^{18–20} The findings of this study would appear to be in direct contrast to this body of literature. However, there are substantial differences between this study and those others that may explain the contradictory results. First, this study took place only in the public sector and none of the health workers had any financial gain from prescribing drugs, unlike in the private sector. Secondly, the item fees in this study covered a complete course of treatment and so there was no financial incentive for patients to purchase incomplete courses of treatment, as may happen in the private sector. Thirdly, this study took place in a controlled environment where drug availability and cost to the patient was the same irrespective of the fee system, unlike in other studies that have compared drug use in the public and private sectors.

Item fees were associated with cost containment of the order of 15–25%, as assessed by calculating wastage costs as a proportion of total costs per prescription. This compares with estimated savings of 10% achieved by generic prescribing and substitution in South Africa.²¹ The estimate that 20–52% of all drug costs, across districts during 1992–95, were 'wasted' through irrational prescribing is consistent with other reported estimates.^{3,4}

When considering item fees as a strategy to contain prescribing costs, the size of effect is important since small reductions in cost, though statistically significant, may not be large enough to justify the effort of implementation. The changes during 1992–95 in the average drug costs per prescription as a proportion of 1992 average drug costs per prescription were +35.8% (+8.7/24.3) in the flat prescription fee district, +1.1% (+0.3/27.7) in the 1-band item fee, and –6.3% (–1.6/25.6) in the 2-band item fee district. In other words, there was a *percentage increase* of 35% or more in the flat prescription fee district compared with no significant change in the item fee districts. According to a review of all intervention studies

aimed at improving the rational use of drugs,²² this relative difference would be classified as large and important.

The controlled before–after design of the study means that it is likely to have had high internal validity. The feasibility of implementing item fees, and their effects on prescribing costs, is demonstrated by the 'uncontrolled' rural conditions in which the study was undertaken. Moreover, in all districts, the average amount of money collected per patient was similar to the expected amount and the resources required to implement the fees were independent of the fee type.¹⁴ All fee systems were acceptable to both patients and health workers, despite 60% of both groups stating that they 'would prefer the fee per prescription because this system would be cheaper for three drug items'.¹⁴ A 'demand' for three drug items per patient is unlikely to lead to cost-effective prescribing.

In summary, this study demonstrates unequivocally the serious economic consequences of irrational prescribing. Charging per drug item, as opposed to charging per prescription, at a low price-level, has been shown to be associated with substantially lower prescribing costs (35% or more) without any adverse effect on prescribing quality. Thus, item fees are likely to be a highly practicable and effective strategy for many developing countries,^{13,14} and there appears to be no justification for charging a fee per prescription as a method of cost recovery. There is still a need to explore the effects of other kinds and level of user fee, and other economic incentives, on prescribing costs and quality.

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