Br J Vener Dis 1983;59:386-93

Social and psychological factors in the distribution of STD in male clinic attenders

III Sexual activity

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SUMMARY We report on the relation between various aspects of sexual activity and risk of infection with sexually transmitted disease (STD) in two groups of men attending an STD clinic. Sexual promiscuity appeared to have little effect on the distribution of most STDs, showing a strong association only with gonorrhoea. This finding was contrary to expectation but consistent with the results reported in the first two papers in this series. In contrast to promiscuity, however, sexual orientation subgroups showed a sharp difference in incidence of the major STDs. Hepatitis and syphilis occurred equally commonly among bisexual and homosexual men, but much less commonly among heterosexuals; NSU occurred more commonly among heterosexual men; and gonorrhoea, though common in all three groups, occurred most commonly in bisexual men and least commonly among heterosexuals. For certain STDs the form of intercourse may be as important a risk factor as sexual promiscuity but the precise mechanisms by which sexual orientation influences risk of STD remain undefined.

Introduction

Sexually transmitted disease (STD) is, by definition, normally acquired through sexual contact, but the aspects of sexual activity that are important in determining the risk of infection have not been defined. In the preceding two papers in this series it has been shown that a wide variety of demographic, social, and psychological factors traditionally associated with increased risk of STD infection contribute little to the distribution of STD among male patients attending a clinic for these diseases. With the exception of gonorrhoea, increased risk of STD showed no association with alcohol or drug abuse, personality disorder, or extreme or unusual attitudes to sex. However, since the traditional association of these factors with STD risk is based on the assumption that they are in turn associated with sexual promiscuity (see introduction to paper I), the question that now arises is whether promiscuity itself is a determinant of STD risk, at least within the clinic sample. The results presented in this paper suggest that, while sexual promiscuity does indeed contribute to the spread of STD, and may be an important aetiological factor for infection with gonorrhoea, other aspects of sexual activity may be of equal importance in determining the risk of infection.

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Accepted for publication 11 April 1983

Patients and methods

Information on sexual activity was obtained from the 210 patients in Group C and from a subgroup of 45 patients from Group B using semistandardised interviews. Full details of the study groups, methods of case identification, and collection and analysis of data are given in the preceding two papers.

DEFINITIONS OF VARIABLES

The definitions of sexual activity variables we adopted were intended to reflect reasonable a priori asumptions about the possible relationships between sexual activity and risk of STD infection. For example, sexual orientation was defined in terms of

behaviour, rather than interests or attitudes, and referred to the full lifetime rather than recent sexual activity. Similarly, the definition of full sexual intercourse we adopted was intended to include any sexual activity involving sustained contact between the mucus membranes of sexual partners. Thus:

Full sexual intercourse—sexual intercourse to orgasm, with or without penetration including, for example, orogenital contact and apposition of the genitalia, but excluding mutual masturbation.

Sexual partner—anyone with whom the subject had had full sexual intercourse.

Sexual promiscuity—the degree of promiscuity in sexual intercourse measured in two main ways, by estimating the number of different sexual partners over defined periods, and by examining the closeness and continuity of the relationships within which full sexual intercourse occurred. Three categories of sexual partner were defined for these relationships: regular sexual partner (one with whom the patient had had full sexual intercourse repeatedly, however infrequently, within a relationship that included in the patient's view, more than sexual gratification alone), prostitute (any sexual partner who charges for sexual services, whether or not the patient himself paid for sexual intercourse), and casual partner (any other sexual partner).

Sexual orientation—we used three mutually exclusive categories relating to the preferred sex of the patient's sexual partner: exclusively heterosexual, (having had full sexual intercourse with members of the opposite sex only), exclusively homosexual (having had full sexual intercourse with members of the same sex only), and bisexual (having had full sexual intercourse with members of both sexes). Except where otherwise indicated in the text, the classification of patients into these three categories was according to their reported sexual activity over their full lifetime. For example, a normally heterosexual subject who had had homosexual experience, even only as an adolescent was classified as bisexual if this included full sexual intercourse, but as exclusively heterosexual if it did not.

Results

NUMBER OF SEXUAL PARTNERS

Table I shows correlation coefficients for the estimated total lifetime numbers of regular and casual sexual partners and prostitutes with STD diagnoses for both the whole of Group C and for each of that group's sexual orientation subgroups. Positive correlations with total STD diagnoses were found throughout, several of which were highly significant. When the diseases were examined separately, however, gonorrhoea appeared to account almost entirely for the positive correlations. Similarly, when the diseases were examined separately within the sexual orientation subgroups, only gonorrhoea showed consistent positive correlations, though NSU correlated with the number of casual partners in heterosexual men.

SEXUAL ORIENTATION

Distribution of STD

Table II shows sexual orientation in Group C patients using χ^2 tables to compare the percentage of subjects in each group who had any STD or a particular STD. In contrast to the number of sexual partners, sexual orientation was found to be an important determinant of the distribution of each of the major diseases examined, even though there were no differences between the groups in overall STD rates. Thus, hepatitis and syphilis occurred less

TABLE I *Correlation coefficients for total lifetime number of sexual contacts with diagnoses, by category of contact and sexual orientation of 191 of the men in Group C*

		Diagnoses				
Study population	*Category of contact*	*Any STD (n = 174)*	*Hepatitis (n = 27)*	*Syphilis (n = 36)*	*Gonorrhoea (n = 82)*	*NSU (n = 101)*
Total (n = 191)	Regular	0·19**	0·03	−0·05	0·18*	0·10
	Casual	0·30**	0·12	0·11	0·28**	0·10
	Prostitute	0·10	0·14*	0·10	0·18*	0·04
Heterosexual (n = 116)	Regular	0·22*	0·12	−0·02	0·15	0·07
	Casual	0·25**	−0·15	−0·06	0·27**	0·22*
	Prostitute	0·12	0·11	0·01	0·14	0·09
Homosexual (n = 30)	Regular	−0·05	0·02	−0·06	0·03	0·23
	Causal	0·37*	0·13	0·19	0·37*	0·08
	Prostitute	0·28	0·10	0·06	0·54**	0·13
Bisexual (n = 45)	Regular	0·28*	−0·08	−0·18	0·34*	0·16
	Casual	0·21	0·15	−0·07	0·02	0·10
	Prostitute	−0·06	0·08	0·23	0·06	−0·11

* = $p<0·05$; ** = $p<0·005$.

TABLE II *Summary of χ^2 tables comparing STD diagnoses in sexual orientation subgroups of Group C patients*

Diagnoses	Percentage of positive diagnoses in: Heterosexuals (n = 116)	Homosexuals (n = 30)	Bisexuals (n = 45)	Significance
Any STD (n = 174)	87	93	97	NS
Hepatitis (n = 27)	5	29	24	<0·001
Syphilis (n = 36)	4	37	43	<0·001
Gonorrhoea (n = 82)	29	50	72	<0·001
NSU (n = 101)	65	27	37	<0·001

NS = not significant.

commonly among heterosexual men and about equally commonly in homosexual men and bisexual men ($p<0·001$). NSU was diagnosed most commonly in heterosexual men and least commonly in homosexual men ($p<0·001$). Gonorrhoea was diagnosed most commonly in bisexual men and least commonly in heterosexual men ($p<0·001$).

Number of sexual partners

In both Groups B and C, bisexual men reported a larger number of sexual partners than homosexual men, and homosexuals a larger number than heterosexual men. For certain of the results, the variation between patients was too large for adequate statistical analysis because of the numbers in each subgroup. Nonetheless, certain trends are evident, and table III shows that in the subgroups of Group B bisexual men had more casual male contacts than homosexual men, but fewer casual female contacts than heterosexual men. Similarly, although bisexual men had had no more regular male partners than homosexual men, they had fewer regular female partners than heterosexual men. Prostitutes were relatively uncommon as sexual partners, and the proportion of patients using prostitutes was equal in each of the sexual orientation subgroups (not shown). Similar results were obtained for Group C (also not shown).

Frequency of sexual activity

Table IV shows that there were no significant correlations between the frequency of sexual intercourse, masturbation, and orgasm and the rates of diagnoses of syphilis, gonorrhoea, and NSU. Table V, however, shows certain differences in frequency of sexual activity between the sexual orientation subgroups. Thus, both heterosexual and bisexual men reported more frequent intercourse than homosexual men ($p<0·05$), but homosexual men reported more frequent masturbation (not significant). Heterosexual men, however, reported slightly higher frequencies both of sexual intercourse and of orgasm during each occasion of sexual intercourse than either bisexual or homosexual men, though both results were just above the 0·05 level of significance.

Forms of sexual intercourse

Tables IV and VI show that heterosexual men practised rectal and oroanal contact much less frequently than bisexual or homosexual men. However, with female partners, bisexual men were

TABLE III *Estimated mean (SD) numbers of sexual partners in total lifetime in subgroup of 45 patients in Group B*

Category of contact	Study population: Total (n = 45)	Heterosexual (n = 18)	Homosexual (n = 11)	Bisexual (n = 16)
Male partners				
Regular	1·8 (2·1)		3·0 (2·0)	3·1 (1·9)
Casual	86·3 (148·7)		109·8 (128·1)	167·1 (193·9)
Total	88·1 (149·3)		112·8 (127·4)	170·2 (194·0)
Female partners				
Regular	2·3 (2·5)	4·3 (2·3)		1·9 (2·0)*
Casual	22·9 (53·2)	36·6 (63·5)		23·4 (55·8)
Total	25·3 (53·4)	40·9 (63·1)		25·1 (55·7)
Total	113·4 (162·7)	40·9 (63·1)	112·8 (127·4)	195·4 (221·1)

* = $p<0·01$.

TABLE IV *Correlation coefficients between various aspects of sexual activity and syphilis, gonorrhoea, and NSU in the subgroup of 45 men (11 passive homosexuals) in Group B*

	Diagnoses of:		
Sexual activity	*Syphilis*	*Gonorrhoea*	*NSU*
Frequency of sexual activity			
sexual intercourse	−0·10	−0·05	0·06
masturbation	0·00	0·05	−0·17
orgasm	−0·09	−0·15	−0·08
Forms of sexual intercourse			
Male partners			
rectal	0·22	0·27	−0·28
orogenital	0·26	0·26	−0·34*
oroanal	0·10	0·11	−0·13
semen swallowing	0·22	0·08	−0·20
Female partners			
rectal	0·07	−0·07	−0·21
orogenital	0·20	−0·15	0·18
oroanal	0·07	0·03	−0·21
vaginal	−0·25	−0·06	0·08
Homosexuality			
Percentage of homosexual partners	0·30*	0·30*	−0·22
Percentage of homosexual partners with whom patient is passive (n = 11)	0·65*	−0·40	−0·41

* = $p<0·01$.

found to be more conservative than heterosexual men, practising oroanal (not significant) and orogenital ($p<0·01$) contact less frequently, and rectal intercourse ($p<0·01$) hardly at all (table VI). The proportion of active to passive homosexual contact was equal in homosexual and bisexual men (table VI). The forms of sexual intercourse practised showed no significant associations in the sample as a whole with the more common STDs, except for NSU which correlated negatively ($p<0·01$) with orogenital contact with male partners (table IV). Among exclusively homosexual men, however, syphilis correlated strongly ($r=0·65$, $p<0·01$) with the percentage of passive homosexual contact (table IV). A significant positive correlation between syphilis and passive homosexual contact ($r=0·34$ $p<0·05$) was found also in Group C patients.

Age of first sexual intercourse

This variable was examined in Group C patients (results not shown). Homosexual men tended to start intercourse later, and bisexual men earlier, than heterosexual men ($p<0·05$). No consistent pattern of correlations was found, however, between STD diagnoses and age of first sexual intercourse.

Age and nationality of sexual orientation sub-groups

Although homosexuals were slightly better represented in the 30-44 year old groups, there were no significant differences between the sexual orientation subgroups when compared for age, nationality, or country of origin (results not shown).

CONTRACEPTIVE PRACTICE

The interviews of Group C patients included enquiries about the use of contraceptives by the patient or his sexual partner, either to prevent conception, or as a prophylactive measure against STD. Homosexual men used contraceptives hardly at all (not shown). Bisexual men used contraceptives

TABLE V *Mean (SD) frequency of sexual activity by sexual orientation of 45 men in Group B*

	Sexual orientation subgroup			
Frequency of sexual activity	*Total (n = 45)*	*Heterosexual (n = 18)*	*Homosexual (n = 11)*	*Bisexual (n = 16)*
Sexual intercourse/week	2·8 (2·0)	3·7 (2·3)	1·6 (0·9)	2·6 (1·8)
Masturbation/week	2·3 (2·4)	2·2 (2·4)	3·0 (3·1)	2·0 (1·9)
Orgasm/occasion of sexual activity	1·4 (1·2)	1·7 (1·9)	1·2 (0·4)	1·2 (0·4)

TABLE VI *Sexual practices compared by sex of partners and sexual orientation of the 45 patients in the subgroup of Group B. Mean (SD) number of sexual practices/group or individual**

Sexual practices	*Total (n = 45)*	*Heterosexual (n = 18)*	*Homosexual (n = 11)*	*Bisexual (n = 16)*
Male partners				
Rectal	0·60 (0·49)		1·00 (0·00)	1·00 (0·00)
Orogenital	0·56 (0·50)		1·00 (0·00)	0·87 (0·34)
Oroanal	0·22 (0·42)		0·27 (0·47)	0·44 (0·51)
Semen swallowing	0·40 (0·49)		0·73 (0·47)	0·62 (0·50)
Total	1·78 (1·63)		3·00 (0·63)	2·94 (1·12)
Female partners				
Rectal	0·07 (0·25)	0·17 (0·38)		0·00 (0·00)
Orogenital	0·49 (0·50)	0·89 (0·32)		0·37 (0·50)
Oroanal	0·07 (0·25)	0·11 (0·32)		0·06 (0·25)
Vaginal	0·71 (0·46)	1·00 (0·00)		0·87 (3·40)
Total	1·44 (1·12)	2·17 (0·78)		1·37 (0·72)
Both male and female partners				
Total	3·04 (1·48)			4·25 (1·53)
Percentage of active homosexuality			56·4 (11·2)	56·9 (12·5)

*The figures for the three individual sexual practices represent the mean (SD) scores for each group (0 = none practises that form of sexual intercourse, 1 = all do); figures for the "totals" represent the mean (SD) number of sexual practices/individual for that group.

almost entirely to prevent conception, and the correlations found with STDs largely reflected this—that is, NSU tended to correlate positively, and gonorrhoea and syphilis negatively, with all forms of contraception (not shown). The use of contraceptives with regular partners by heterosexual men gave no results of interest. Table VII, however, shows that the use of the pill, IUCD, and dutch cap, but not the condom, by heterosexual men with casual partners correlated positively with NSU and gonorrhoea.

Discussion

The findings in table II of this study are broadly consistent with previous reports that the distribution of STD within clinic samples varies with sexual orientation. Syphilis,[1-4] hepatitits,[5 6] and gonorrhoea[7] are all more common among homosexual men and NSU among heterosexual men.[7] The mechanisms by which sexual orientation influences STD risk are unknown but may be clarified by this study.

Traditional assumptions about the aetiology of STD (see introduction to paper I) suggest that differences in STD rates between the sexual orientation subgroups should reflect differences between them in a) degree of sexual promiscuity, and b) delinquency, other psychological abnormality, or both. In the first two papers in this series, little evidence was found to support the second of these two assumptions, except possibly, and to a limited extent, in the case of gonorrhoea. In this paper, aspects of sexual activity, including sexual promiscuity, were examined and large differences were found between the sexual orientation subgroups. In particular, although prostitutes appeared relatively unimportant as in previous reports,[8] bisexuals reported many more casual partners than homosexuals, who in turn reported many more than heterosexuals (table III). As they stand, however, these differences do not provide support for the first of the two traditional assumptions, since total STD risk was not significantly different between the three subgroups

TABLE VII *Correlation coefficients for contraceptive practice with STD diagnoses for casual contacts of the heterosexual men in Group C*

Contraceptive practice	*Total (n = 191)*	*Diagnoses*			
		Hepatitis (n = 27)	*Syphilis (n = 36)*	*Gonorrhoea (n = 82)*	*NSU (n = 101)*
Pill	0·16*	−0·13	−0·01	0·21*	0·22*
IUCD	0·26**	−0·02	0·07	0·24*	0·20*
Condom	0·07	−0·01	−0·01	0·07	0·10
Dutch cap	0·09	0·21*	−0·03	0·21	0·20*

* = p<0·01, ** = p<0·001.

(table II). The most striking difference between the sexual orientation subgroups was in the distribution of diseases (table II). Thus, for hepatitis and syphilis, the distribution was HOM = BIS>HET (homosexuals and bisexuals at approximately equal risk, and both at greater risk than heterosexuals); for gonorrhoea it was BIS>HOM>HET; and for NSU it was HET>BIS>HOM.

In Group B therefore, it was only in respect of gonorrhoea that the differences in risk of infection between the sexual orientation subgroups (BIS>HOM>HET) corresponded with the differences in degree of sexual promiscuity (also BIS>HOM>HET). Similarly, in Group C (table I), it was only for gonorrhoea that the risk of infection correlated overall with the number of sexual partners. In papers I and II, it was only gonorrhoea that satisfied to any extent at all the traditional assumption linking STD risk and delinquency. Likewise, in this paper it is only gonorrhoea that satisfies the traditional assumption linking STD risk and sexual promiscuity. It follows, therefore, that traditional assumptions about STD risk must be modified. However important sexual promiscuity (and other delinquent behaviours) may be in the aetiology of STD, there must be other factors of at least equal importance. Indeed, as Thin and Smith have pointed out,[7] the fact that different STDs are differently distributed between the sexual orientation subgroups shows that more than one aetiological factor, and hence factors other than sexual promiscuity, must be operating.

What could these factors be? Various non-sexual differences between the sexual orientation subgroups have been suggested, such as age, nationality, and drug and alcohol abuse.[2 7] We found, however, that the groups were either not different in these respects or they differed in ways that, with the partial exception of gonorrhoea, were not consistent with the differences in STD rates (see results and papers I and II). In this respect, however, the differences between the groups in aspects of sexual activity other than promiscuity were of more interest. Differences in the frequency and intensity of sexual activity (tables V), in the forms of intercourse practiced (table VI), and in associated practices such as contraception (table VII), might all in principle be important. The first of these was consistent with the results for libido reported in paper II in showing no findings of interest. The last confirmed results reported by other workers[9] that the use of a condom with casual female partners has some protective effect, at least for gonorrhoea and NSU. The differences between the sexual orientation subgroups in gonorrhoea and NSU risk cannot, however, be explained by differences between them in contraceptive practice (see results), since the protective effect is closely similar for both diseases (table VII). Furthermore, if differences in contraceptive practice were crucial for any particular disease, that disease should be distributed between the subgroups HOM>BIS>HET (the converse of contraceptive use, HOM<BIS<HET), but this distribution was found for none of the diseases examined.

The results for the forms of intercourse practised (table VI) do, however, show certain features of possible aetiological significance. Reference to table VI together with tables I to IV suggests two patterns of results, one of significance for syphilis, the other for NSU.

Syphilis Pattern—In Group B bisexuals, in their activities with male partners, were found to practise the same forms of intercourse, including the same frequency of passive intercourse, as homosexuals (table VI). Hence, if the form of homosexual intercourse, as distinct from the number of homosexual partners, is an important risk factor for a particular STD, this should be reflected in a) similar rates for that disease in both homosexuals and bisexuals and, b) a positive correlation between some form of homosexual intercourse and the disease in question. We have shown here that homosexuals and bisexuals were indeed at similar risk for both syphilis and hepatitis (table II). In Group B (in which forms of intercourse were examined in detail by sex of partner) we did not have data for hepatitis. Syphilis, however, showed a strong positive correlation with passive homosexual intercourse (table IV).

NSU Pattern—In Group B bisexuals, although found to practise overall a wider range of forms of intercourse than either heterosexuals or homosexuals, largely practised vaginal intercourse in their relations with women (table VI). Similarly, although bisexuals had more casual partners overall than either heterosexuals or homosexuals, they had fewer casual female partners than heterosexuals (table III). In Group B therefore, the relative risk of NSU between the sexual orientation subgroups HET>BIS>HOM, corresponded with promiscuous vaginal intercourse. Similarly, in Group C (in which partners were not differentiated by sex) NSU correlated with the number of casual partners only among heterosexual men (table I).

Thus, in the present investigation gonorrhoea, syphilis, and NSU each showed quite different patterns of association with sexual activity. Gonorrhoea was associated with promiscuity, syphilis with passive homosexual intercourse, and NSU with promiscuous vaginal intercourse. There was, therefore, no simple, overall, and direct association between STD risk and promiscuity as traditionally assumed. These results, however, may

be accommodated to traditional assumptions by a small modification in the idea of "sexually transmitted disease" itself. The idea of a sexually transmitted disease derives from the observation that certain diseases are infectious only (or mainly) under the particular conditions of close physical contact that obtain during sexual intercourse. The modification of this idea now required is simply that different STDs are infectious to different degrees in different forms of sexual intercourse.

With this modification the three patterns of association found in this study, and other similar patterns, may be readily explained. The gonorrhoea pattern would arise for diseases that, although capable of being transmitted by many different forms of intercourse, are of only moderate infectivity in each of them. Frequent exposure to infection, but not the form of that exposure, would thus correlate with risk. The syphilis pattern would arise for diseases that are highly infectious but only during certain particular forms of intercourse. Such diseases would rapidly become endemic within a group practising those forms of intercourse, but frequent or repeated exposure within that group would make little difference to the risk of infection. The NSU pattern would arise for diseases intermediate between gonorrhoea and syphilis that are moderately infectious in many different forms of intercourse, but more so in some than in others.

The results of the present investigation, therefore, although not consistent with traditional assumptions about the aetiology of STD, are consistent with a plausible modification of these assumptions. This modification, indeed, is not without support. Holmes showed that gonorrhoea was of relatively low infectivity, at least as transmitted from women to men.[10] Other workers noted the possible aetiological correlation between passive rectal intercourse and syphilis.[4] Fox reported evidence of reservoirs of non-specific infection in asymptomatic women.[11] Taken as a hypothesis about the aetiology of STD, the modification suggests many potentially fruitful lines for further research, although an important caveat must be made about the form of our investigation. Within clinic comparisons may help to distinguish those differences in an STD clinic population that are aetiologically relevant from those that are not (see discussion, paper I). Such studies are also economical and may be carried out to good effect with very limited resources. With larger resources, indeed, the present study could certainly be improved and extended: to other clinics, with more detailed and better validated interviews and questionnaires, more sophisticated diagnostic methods, etc. Studies of this kind, however, will always be severely limited in their powers of resolution. In particular, with this study it was impossible to differentiate reliably between those who simply acquire STD infection and those who tend to infect others, although such differentiations may well be crucial to our understanding of STD risk. For example, a small group of promiscuous subjects might infect large numbers of relatively unpromiscuous partners, but such a group would be extremely difficult to distinguish in a cross section of clinic attenders. Indeed, the members of such a group might well be among those who, though infected, do not attend clinics for treatment at all.

Ways must be found, therefore, to improve the resolution of our studies. We could use longitudinal rather than cross sectional research designs to trace chains of infection and not confine our work to clinic attenders. This would be complex and expensive, but would be worthwhile if it were to yield more complete knowledge of the precise mechanisms by which STDs are transmitted. There are good historical precedents to suggest that the control of infectious diseases often depends on knowledge of just this kind. Such studies, therefore, could make an important contribution to the development of more effective methods of STD prevention and, hence, to greater control of the present epidemic.

Conclusions to papers I to III

The results of the present investigation suggest three hypotheses in place of traditional assumptions about the aetiology of STD: a) the activities associated with STD risk differ from disease to disease; b) sexually promiscuous behaviour is an important risk factor particularly for gonorrhoea, but other factors, in particular the form of intercourse, may be equally important; and c) delinquency and other psychological abnormalities are not closely related to STD risk except possibly, and to a limited extent, in the case of gonorrhoea.

Cross sectional within clinic studies of the kind reported here may, however, underestimate the aetiological importance of small groups of highly promiscuous, and possibly otherwise abnormal, people. Longitudinal studies are therefore required to clarify further the behavioural risk factors in the aetiology of STD.

We thank Professor D E Barton of the institute of computer science and statistics, Queen Mary College, London University, and his staff, for their considerable help with the statistical analyses. We also thank the medical, reception, and nursing staff of the department of sexually transmitted diseases, Middlesex Hospital, London, without whose assistance the study would not have been possible. Certain of the data on hepatitis have been reported previously but are included in this communication for the sake of completeness.

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