

## Ambulatory Care

# Collaborative Services Among Community Pharmacies for Patients with Diabetes

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**BACKGROUND:** Patients performing self-monitoring of blood glucose (SMBG) may benefit from community pharmacy services. However, wide-scale implementation of these services is limited. Many pharmacy characteristics (eg, physical layout of the pharmacy, knowledge and competence of the pharmacy team) are reported to be relevant when implementing these services. Still, the importance of local agreements on the division of roles with, for example, local general practitioners or diabetes nurses, is less clear.

**OBJECTIVE:** To study the association between local collaboration and the level of services provided by community pharmacies to patients performing SMBG.

**METHODS:** In 2004, we performed a cross-sectional survey among all 1692 Dutch community pharmacies. Data were gathered on provision of services for SMBG, local agreements, and pharmacy characteristics. Data were analyzed using logistic regression. Associations were adjusted for pharmacy characteristics.

**RESULTS:** About 44% (724) of the community pharmacies returned the questionnaire. Pharmacies that were not involved in local collaborative services on patient counseling reported to provide fewer services compared with those that were involved in such agreements (OR 0.26, 95% CI 0.13 to 0.53). Similar findings were observed for agreements on calibration of SMBG equipment (0.17, 0.04 to 0.71). The associations remained after adjusting for pharmacy characteristics.

**CONCLUSIONS:** Local collaboration on the division of roles in diabetes care between healthcare professionals is independently associated with the number of pharmacy services provided to patients performing SMBG.

**KEY WORDS:** community pharmacy services, diabetes mellitus, interprofessional collaboration.

*Ann Pharmacother* 2005;39:xxxx.

Published Online, 6 Sept 2005, [www.theannals.com](http://www.theannals.com), DOI 10.1345/aph.1G109

Education on self-management of diabetes is considered an integral component of all care plans for diabetic patients.<sup>1</sup> An important aspect of self-management is the self-monitoring of blood glucose (SMBG). This is recognized in national and international pharmacy practice guidelines, which promote the role of community pharmacies in supporting patients performing SMBG.<sup>2-4</sup> Pharmacist-led intervention programs, including education and training of patients in SMBG skills, showed a decrease in hemoglobin A<sub>1c</sub> values attributed to the pharmaceutical care services.<sup>5-8</sup>

Community pharmacy's self-monitoring support focuses on patient counseling and calibration/checking of testing equipment.<sup>2</sup> To what extent these services are implemented is not known, but daily practice suggests large variation among pharmacies.<sup>9-11</sup>

The type and number of pharmaceutical services provided by community pharmacies are probably influenced by the characteristics of the local system for care of patients. Since diabetes treatment requires a team approach,<sup>12</sup> an important characteristic could be the presence or absence of local collaboration among healthcare providers. The existence of a local agreement between different healthcare providers on the division of roles in supporting patients performing SMBG is an essential part of these collaborations. The aim of this study was to determine whether such local agreements influence the provision of community pharmacy services to patients performing SMBG.

## Methods

### SETTING AND DESIGN

We conducted a cross-sectional survey among all Dutch community pharmacies registered in January 2004. This study consisted of 2 stages. First, semi-structured interviews with 7 pharmacists were held to identify

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This research was funded by the Scientific Institute of Dutch Pharmacists.

relevant local and pharmacy-related factors potentially associated with the provision of services to patients performing SMBG. These pharmacists also pretested the final survey and found it to be comprehensive. A pilot study among 50 randomly selected community pharmacies was performed to determine feasibility, as well as a limited validation on variability in responses and comprehensibility. To obtain enough contrast in responses on dichotomous questions, we required, a priori, that all response categories be checked by at least 10% of all respondents. If the item's response categories were checked less often, we either rephrased or deleted the response category or rephrased the item. The results of the pilot questionnaires were excluded from the final analysis.

In the second stage, a mailing was sent in February 2004 to all Dutch community pharmacies not involved in the pilot study. It was addressed to the senior pharmacist in the institution. The invitational letter stated that the Internet-based survey was intended for the pharmacist responsible for patient care activities. Participants could respond anonymously. After 3 weeks, all pharmacies received a reminder and a paper version of the survey, which could be returned at no cost.

Of all respondents, sites that functioned as an annex of another pharmacy (limited services available and open only a few hours per day) were excluded. In most regions, only a few pharmacists dispense outside of office hours. This "out-of-hours" service rotates among all pharmacies in a particular region. However, in some regions, a specialized out-of-hours pharmacy has been created that conducts all out-of-hours dispensing. These pharmacies were also excluded from the analysis.

**SURVEY**

The questionnaire (<http://www.hwbooks.com/pdf/questionnaire.pdf>) consisted of 47 items. Apart from questions on the provision of pharmacy services to patients practicing SMBG, it also gathered information on a large set of factors that were found to be associated with the provision of services in literature<sup>13,14</sup> or derived from the semi-structured interviews during the first stage of the study.

**DEFINITION OF SELF-MONITORING SERVICES**

Based on the Dutch pharmacy practice guidelines,<sup>2</sup> we defined 5 separate support activities in 3 areas of pharmacy services for patients performing SMBG: patient counseling, calibration/checking of SMBG equipment, and providing blood glucose meters at no cost to patients performing SMBG for a short period. Since, in the Netherlands, patients who use oral hypoglycemic agents usually do not receive full reimbursement for the blood glucose meter, some pharmacists provide one to patients to reduce initial costs of SMBG.

Counseling was subdivided into 3 domains: choosing a suitable blood glucose meter, operating that meter, and performing the test procedure. Respondents were asked which support activities they performed. The total number of activities was calculated. Since no consensus on the relative importance of these activities exists, all activities were weighed equally. Services that were not prompted by the pharmacy, for example, patient counseling in response to a specific question from the patient, were excluded.

**LOCAL AGREEMENTS ON SMBG**

We inquired as to whether local agreements existed on 2 topics: patient counseling and calibration/checking of SMBG equipment. Based on the parties involved in the agreement, responses were classified as follows: no local agreements, local agreement without a pharmacy participating, and local agreement with a pharmacy participating. Of all agreements in which a community pharmacy participated, we evaluated the description of the content of the agreement as provided by the respondent. We categorized them as containing either an active or passive role (eg, if it was agreed that the pharmacy would refrain from patient counseling). The different categories are summarized in Table 1.

**PHARMACY CHARACTERISTICS**

The pharmacy characteristics gathered were the number of pharmacists and technicians, current vacancies for a pharmacist or technician,

number of prescriptions per day, and presence of a separate counseling area. Knowledge of the pharmacy team on SMBG as perceived by the respondent was determined using 3 statements concerning the ability of the pharmacy's staff to provide patient counseling. Workload was ascertained through agreement with a statement on workload being a reason for providing less counseling than desired. All of these items were defined as pharmacy characteristics, as they all were, to a certain extent, directly controllable by the community pharmacist. Because respondents might not always be the actual proprietor of the pharmacy, we also included a question on the pharmacist's perception of his or her independence to determine the level of services in diabetes care. Perceived knowledge, level of independence, and workload were scored on a 4-point scale (entirely disagree to entirely agree).

**DATA ANALYSIS**

Pharmacies reporting that they perform  $\leq 2$  of the 5 support activities defined in the practice guidelines were classified as low-level service (LLS) pharmacies. High-level service (HLS) pharmacies were those that performed 3, 4, or all of the support activities. The effect of local agreements was analyzed in 3 different ways: (1) based on the parties involved in the agreement, with no local agreement as reference, (2) comparing any local agreement with no local agreement, and (3) comparing active involvement of a community pharmacy in a local agreement to passive involvement. All analyses were performed separately for the topic of the agreement.

To study the effect of local agreements independent of pharmacy characteristics, we used 2 methods. First, we calculated changes in model statistics of a logistic regression model with the level of services as a dependent variable and all pharmacy characteristics as independent variables after addition of the factor "local agreement." Again, the effect of agreements was analyzed in the 3 different ways mentioned above. Secondly, the crude odds ratio of pharmacies (HLS vs LLS) involved in agreements on calibration/checking of SMBG equipment compared with no local agreement was compared with the odds ratio after adjusting for different pharmacy characteristics. Respondents who agreed that they could not determine the pharmacy's policy on diabetes care independent of any possible proprietors of that pharmacy were excluded from this analysis.

Furthermore, the association of pharmacy characteristics with the provision of services was determined. The extreme categories in the questions regarding staff's knowledge and workload were used infrequently. Therefore, we analyzed workload as a dichotomous variable. Knowledge was classified as sufficient when respondents agreed on  $\geq 2$  statements.

All associations were adjusted for having a diabetes care improvement project implemented in the respondent's pharmacy.

**Results**

Of all 1692 pharmacies in the main study, 757 returned the questionnaire. After exclusion of annexes and out-of-hours pharmacies, 724 (44%) remained. Data on local agreements on patient counseling were missing from 81 responses,

**Table 1. Classification of Local Agreements**

<p><b>Topic of agreement</b>                  patient counseling                  calibration/checking</p> <p><b>Parties involved in agreement</b>                  none (no local agreement)                  agreement, community pharmacy not participating<sup>a</sup>                  agreement, community pharmacy participating<sup>a</sup>                      active involvement                      passive involvement</p>
<p><sup>a</sup>These categories were also grouped to form the category "any local agreement."</p>

resulting in 643 (39%) evaluable questionnaires. For analyses of local agreements on calibration/checking of SMBG equipment, 695 questionnaires were evaluable.

**LOCAL AGREEMENTS AND THE PROVISION OF SMBG SERVICES BY COMMUNITY PHARMACIES**

Table 2 shows the characteristics of pharmacies offering LLS and those providing HLS. An average of one service was offered in LLS pharmacies, which primarily was counseling on the choice of a blood glucose meter or blood glucose testing procedure. HLS pharmacies provided an average of almost 4 activities.

Overall, the existence of any local agreement on patient counseling or calibration/checking of SMBG equipment was reported by 31% (228) and 13% (91) of all pharmacies, respectively. Of all 724 respondents, 8% (58) did not know whether there was any cooperation on patient counseling; 12% (83) were aware of agreements on calibration/checking. A local agreement was often between general practitioners and pharmacists, diabetes nurses and pharmacists, or general practitioners and diabetes nurses if the agreement did not include a pharmacy.

**ASSOCIATION BETWEEN LOCAL AGREEMENTS AND LEVEL OF SERVICES**

Table 3 reports the associations between the 3 ways local agreements were analyzed and the level of services. Respondents who reported a local agreement in which the pharmacy participated were more likely to provide HLS. In contrast, those who reported an agreement in which the pharmacy did not participate were less likely to work in an HLS pharmacy compared with no local agreement. This was significant only for agreements on patient counseling. Furthermore, pharmacies actively involved in the agreement were more likely to be HLS pharmacies. This observation was similar for agreements on calibration/checking, although the associations between agreements on calibration/checking and the level of services were more pronounced than the associations between patient counseling and level of services.

Among respondents who could determine their policy on self-monitoring support independent of the proprietors (n = 82%, 590 pharmacies), adjusting for having a diabetes care improvement project implemented in the pharmacy attenuated most odds ratios by >10%. However, almost all odds ratios remained significant.

In sensitivity analyses using different definitions of LLS and HLS pharmacies, local agreements remained independently associated with the provision of services (data not shown).

Still, apart from local agreements, pharmacy characteristics were also associated with the level of services. A vacancy for a pharmacist, having a separate counseling area, and sufficient team knowledge of SMBG were more common among HLS pharmacies compared with LLS pharmacies.

**Table 2. Characteristics of Pharmacies with a Low and a High Level of Self-Monitoring Services<sup>a</sup>**

Parameter	n	Low Level	High Level
Number of services provided, mean (SD)	724	<b>1.0 (0.87)</b>	<b>3.8 (0.72)</b>
Proportion of times a service is provided, <sup>b</sup> % (n)	507		
<50%		<b>29 (49)</b>	<b>21 (70)</b>
50–80%		<b>54 (91)</b>	<b>50 (169)</b>
>80%		<b>16 (27)</b>	<b>30 (101)</b>
<b>Local agreements, % (n)</b>			
agreement on patient counseling	643		
any		57 (98)	55 (130)
none		33 (168)	38 (189)
do not know		10 (30)	8 (28)
parties involved in the agreement on counseling for SMBG	585		
pharmacy participating		<b>20 (52)</b>	<b>34 (107)</b>
pharmacy not participating		<b>17 (46)</b>	<b>7 (23)</b>
no local agreement		<b>63 (168)</b>	<b>59 (189)</b>
type of pharmacy containing agreement on counseling for SMBG	105		
pharmacy plays an active role		<b>29 (9)</b>	<b>73 (54)</b>
pharmacy plays a nonactive role		<b>71 (22)</b>	<b>27 (20)</b>
agreement on calibration/checking	611		
any		<b>8 (26)</b>	<b>17 (64)</b>
none		<b>74 (241)</b>	<b>76 (281)</b>
do not know		<b>18 (58)</b>	<b>7 (25)</b>
parties involved in agreement on calibration/checking of SMBG equipment	611		
pharmacy participating		<b>6 (17)</b>	<b>16 (56)</b>
pharmacy not participating		<b>3 (8)</b>	<b>2 (8)</b>
no local agreement		<b>91 (241)</b>	<b>81 (281)</b>
type of pharmacy containing agreement on calibration/checking of SMBG equipment	47		
pharmacy plays an active role		64 (7)	86 (31)
pharmacy plays a nonactive role		36 (4)	14 (5)
pharmacy is part of healthcare center	723	19 (56)	15 (50)
data not available			0 (1)
<b>Pharmacy characteristic, % (n)</b>			
pharmacy independent to determine policy on SMBG services	724		
entirely disagree		<b>22 (75)</b>	<b>15 (59)</b>
entirely agree		<b>78 (264)</b>	<b>85 (326)</b>
pharmacy team has sufficient knowledge of SMBG	724		
entirely disagree		<b>57 (173)</b>	<b>62 (43)</b>
entirely agree		<b>43 (166)</b>	<b>38 (342)</b>
separate counseling area	719		
available		<b>69 (233)</b>	<b>80 (306)</b>
not available		<b>31 (104)</b>	<b>20 (76)</b>
vacancy for pharmacists	724	<b>4 (14)</b>	<b>8 (31)</b>

SMBG = self-monitoring of blood glucose.

<sup>a</sup>Characteristics that differed significantly (p value  $\chi^2$  or t-test <0.05) are shown in bold type. Due to missing data, not all numbers total 724.

<sup>b</sup>Not included are 116 pharmacies that reported they provide no services.

**INFLUENCE OF PHARMACY CHARACTERISTICS**

When adjusted for all pharmacy characteristics, the association between local agreement on calibration/checking of SMBG equipment and the level of services remained. Figure 1 demonstrates that, of all pharmacy characteristics, only adjustment for knowledge of SMBG had some effect on the association between local agreement and level of services. Still, it remained statistically significantly different from one. Similar findings were observed when analyzing the association between local agreements on patient counseling or when using different ways to categorize local agreements (data not shown).

The independent effect of local agreement on the level of services is underlined by the changes in model statistics, although the results were less pronounced. Introducing local agreements (defined as the comparison between no local agreements to agreements with or without pharmacy's

involvement) to a model containing all pharmacy characteristics improved the model significantly. The p value of the likelihood ratio test was 0.029 and 0.048 for agreements on patient counseling and calibration/checking, respectively. Active compared with passive involvement in patient counseling also significantly improved the model (p value likelihood ratio 0.004). Local agreements defined as any local agreement compared with no local agreement did not improve the model significantly (p > 0.30).

**Discussion**

This study shows that a community pharmacy's involvement in local agreements is associated with the provision of more services to patients performing SMBG. The association was independent of pharmacy characteristics, but only for agreements on patient counseling. For agreements on calibration/checking of SMBG equipment, we

**Table 3.** Association Between Local Agreements as well as Pharmacy Characteristics and the Provision of Pharmacy Services

Parameter	Crude OR (95% CI)	Adjusted OR (95% CI) <sup>a</sup>
Implementation of diabetes care improvement project in daily care (n = 695) yes	3.72 (2.71 to 5.11)	NA
Local agreement on pt. counseling on SMBG (n = 466) any (n = 187)	1.30 (0.90 to 1.90)	1.14 (0.77 to 1.70)
none (n = 279)	1.00 (reference)	1.00 (reference)
Parties involved in the agreement on pt. counseling on SMBG pharmacy participating (n = 132)	2.16 (1.38 to 3.37)	1.74 (1.09 to 2.78)
pharmacy not participating (n = 55)	0.42 (0.23 to 0.78)	0.46 (0.24 to 0.87)
no local agreement (n = 279)	1.00 (reference)	1.00 (reference)
Type of pharmacy-containing agreement on pt. counseling on SMBG pharmacy plays an active role (n = 50)	6.32 (2.14 to 18.6)	5.00 (1.62 to 15.4)
pharmacy plays a nonactive role (n = 36)	1.00 (reference)	1.00 (reference)
Local agreement on calibration/checking of SMBG equipment any (n = 71)	2.38 (1.35 to 4.21)	2.06 (1.14 to 3.72)
none (n = 412)	1.00 (reference)	1.00 (reference)
Parties involved in the agreement on calibration/checking of SMBG equipment pharmacy participating (n = 60)	3.54 (1.79 to 7.00)	3.07 (1.52 to 6.20)
pharmacy not participating (n = 11)	0.66 (0.20 to 2.20)	0.53 (0.15 to 1.86)
no local agreement (n = 412)	1.00 (reference)	1.00 (reference)
Type of pharmacy-containing agreement on calibration/checking of SMBG equipment pharmacy plays an active role (n = 32)	7.00 (1.23 to 39.8)	8.20 (1.15 to 58.4)
pharmacy plays a nonactive role (n = 8)	1.00 (reference)	1.00 (reference)
Pharmacy is part of healthcare center (reference, not part of healthcare center) (n = 546)	0.84 (0.52 to 1.36)	0.88 (0.53 to 1.47)
Pharmacy characteristic n of pharmacists (n = 557) <sup>b</sup>	0.99 (0.79 to 1.25)	0.94 (0.73 to 1.21)
n of technicians (n = 534) <sup>b</sup>	1.02 (1.00 to 1.04)	1.02 (1.00 to 1.04)
vacancy for pharmacist (reference, no vacancy) (n = 565)	1.89 (0.93 to 4.22)	2.36 (1.07 to 5.24)
vacancy for technician (reference, no vacancy) (n = 564)	1.08 (0.67 to 1.74)	0.97 (0.59 to 1.61)
n of prescriptions per day (n = 565) small pharmacy	0.69 (0.46 to 1.05)	0.70 (0.44 to 1.08)
average pharmacy	1.00 (reference)	1.00 (reference)
large pharmacy	1.19 (0.78 to 1.81)	1.13 (0.73 to 1.75)
separate counseling area available (reference, no separate area) (n = 563)	1.77 (1.20 to 2.61)	1.57 (1.04 to 2.38)
sufficient knowledge of SMBG (reference, no sufficient knowledge) (n = 565)	9.79 (6.08 to 15.4)	8.20 (5.09 to 13.2)
agrees entirely that workload is reason to provide less pt. counseling than planned (reference, entirely disagree) (n = 565)	0.81 (0.58 to 1.14)	0.94 (0.65 to 1.34)

NA = not applicable; SMBG = self-monitoring of blood glucose.  
<sup>a</sup>Adjusted for implementation of diabetes care improvement project in daily practice. Analyses performed among respondents who reported to determine the policy on diabetes care independent of the actual owners of the pharmacy.  
<sup>b</sup>Per one full-time equivalent.



nationwide diabetes care improvement project. Yet, the number was similar to the actual participation rate (48% and 45%, respectively).<sup>20</sup>

Nonresponse and self-reporting might lead to an overestimation of the absolute level of services, which is a common problem of surveys into professional behavior.<sup>21</sup> We tried to minimize this bias by allowing the respondent to estimate the proportion of times a service was actually provided. Furthermore, our questionnaire was anonymous. Still, extrapolations of the number of pharmacies providing a certain activity must be interpreted with care, also with respect to the nonresponse. However, even if self-reported behavior represents overestimation of the actual level of services, self-perceptions are important since they are likely to be linked to the motivation of pharmacists to either change their practice or make no changes. Moreover, since we performed only a limited validation of our questionnaire, our results must be interpreted in light of the instrument used.

## Conclusions

Although the pharmacy's involvement in local agreements is an important determinant of the level of services provided to patients performing SMBG, it is not the only factor. To become an HSL pharmacy, other structural aspects related to the pharmacy must also be fulfilled. This indicates that interventions to overcome barriers in the pharmaceutical care of SMBG must be focused on internal processes as well as cooperation with other healthcare professionals. Moreover, it also suggests that the level of services is, to a large extent, directly controllable by the individual pharmacist.

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## EXTRACTO

**TRASFONDO:** Los pacientes que llevan a cabo monitorización de su glucosa en sangre ("self-monitoring of blood glucose" o "SMBG," por sus siglas en inglés) pueden beneficiarse de servicios de farmacias de comunidad. Sin embargo, la implantación de estos servicios a gran escala es limitada. Muchas características de las farmacias, por ejemplo, el diseño físico de la farmacia, el conocimiento, y la competencia del equipo de trabajo de la farmacia, se reportan como relevantes al implantar estos servicios. Aún así, la importancia de los acuerdos locales en cuanto a la división de los papeles que desempeñan, por ejemplo, los médicos generalistas o enfermeras especialistas en diabetes, está menos claro.

**OBJETIVO:** Estudiar la asociación entre los acuerdos locales y el nivel de los servicios provistos por las farmacias de comunidad a pacientes que

llevan a cabo monitorización de su glucosa en sangre.

**MÉTODOS:** En 2004, se hizo una encuesta transversal entre las 1692 farmacias de comunidad holandesas. Se recopilaron datos sobre la prestación de servicios a pacientes que llevan a cabo monitorización de glucosa en sangre, los acuerdos locales, y las características de las farmacias.

**RESULTADOS:** Alrededor de 44% (724) de las farmacias de comunidad respondieron el cuestionario. Las farmacias que no estaban involucradas en acuerdos locales sobre consejería a pacientes reportaron proveer menos servicios en comparación con aquellas que estaban involucradas en dichos acuerdos (riesgo relativo estimado ["odds ratio"] e intervalo de confianza al 95%: 0.26 [0.13 a 0.53]). Se observaron hallazgos similares respecto a acuerdos sobre calibración de equipo para monitorización de glucosa en sangre por el paciente (riesgo relativo estimado e intervalo de confianza al 95%: 0.17 [0.04 a 0.71]). Las asociaciones se mantuvieron luego de ajustar por características de las farmacias.

**CONCLUSIONES:** Los acuerdos locales sobre la división de los papeles que desempeñan los profesionales de salud en el cuidado de la diabetes están asociados independientemente con el número de servicios de farmacia provistos a pacientes que llevan a cabo monitorización de su glucosa en sangre.

Ana E Velez

#### RÉSUMÉ

**OBJECTIF:** Évaluer l'association entre des ententes locales et le niveau de services prodigués par les pharmaciens communautaires chez les patients diabétiques effectuant une autosurveillance glycémique.

**MÉTHODES:** En 2004, les auteurs ont effectué une étude transversale chez 1692 pharmacies communautaires en Hollande. Les données ont été collectées sur les services pharmaceutiques prodigués au niveau de l'autosurveillance glycémique, les ententes locales, et les caractéristiques des pharmacies communautaires. Les données ont été analysées en utilisant un modèle de régression logistique. Les associations ont été ajustées selon les caractéristiques des pharmacies.

**RÉSULTATS:** Environ 44% (724) des pharmaciens ont retourné le questionnaire. Les pharmacies n'étant pas impliquées dans les ententes locales au niveau de l'autosurveillance glycémique ont rapporté qu'ils avaient prodigué moins de services pharmaceutiques lorsqu'ils étaient comparés aux pharmacies qui étaient impliquées dans cette entente (rapport de cotes (OR) et 95% intervalle de confiance (CI) 0.26 [0.13 à 0.53]). Des résultats semblables ont été observés pour les ententes sur l'étalonnage des appareils utilisés pour l'autosurveillance glycémique (OR et 95% CI: 0.17 [0.04 à 0.71]). Ces associations demeurent lorsqu'elles sont ajustées pour les caractéristiques des pharmacies.

**CONCLUSIONS:** Des ententes locales sur les rôles des différents professionnels de la santé dans le traitement du diabète sont associées de façon indépendante au nombre de services pharmaceutiques prodigués aux patients effectuant une autosurveillance glycémique.

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